City of Richmond

MASTER PLAN
Environmental Element

DRAFT
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INTRODUCTION

Chapter 1

WHY THIS MASTER PLAN AMENDMENT?

The City of Richmond adopted its first Master Plan to guide development of the City in 1946, and since then has amended and updated the Plan several times. The current Master Plan consists of three elements: a City-wide revision approved by City Council in 1983, the Downtown Plan approved as a major amendment in 1984, and the Housing Plan approved in 1988. This environmental element is yet another amendment which greatly expands the City's efforts to protect our natural heritage for present and future generations.

There are few simple solutions to environmental problems. It is only through a comprehensive strategy that the City can adequately address all the key environmental issues without creating undesirable imbalances or unforeseen side effects. In formulating this element many environmental issues were analyzed as were the laws and programs which affect them.

The City is faced with many mandates from the State and Federal governments which require the local implementation of environmental programs. The threat of lawsuits or withholding of funds is very real if the City does not comply. There is also a need to make sense of the bewildering array of requirements at all levels of government so that compliance is accomplished as efficiently as possible.

Tangible benefits of employing a comprehensive environmental strategy include:

- LIVEABILITY: Richmond has innumerable attributes which make it a very attractive place to live and work. Proper stewardship of the City's parks, urban landscape, and other elements of the natural environment is essential to maintaining liveability.

- ECONOMIC DEVELOPMENT: The qualities which make Richmond attractive to current residents also make it attractive to prospective residents, businesses, and visitors. The natural environment is a critical element in the marketability of the City and is of primary importance to its economic base.

- COMPREHENSIVE APPROACH: Many initiatives are already being undertaken by the City to protect or improve the environment; however, coordination and consistency are often lacking. A more comprehensive approach will ensure that available resources are used in an efficient manner for environmental protection.

This master plan environmental element represents the first comprehensive policy guidance offered in this complicated arena.

PURPOSES OF THE ENVIRONMENTAL ELEMENT

The environment is affected by the actions of the business community, City government, and thousands of private citizens. As a part of the City's Master Plan, the environmental element provides a framework to guide businesses, residents, and community leaders in making decisions which are sensitive to the environment. Specifically, it sets forth policies and directions for City actions, and recommends projects and programs which will prevent or reduce environmental degradation.

Amendments to the Land Use Plan which guides private and public development are recommended as are policies to enhance protection of natural features, improve water quality, protect wildlife habitat, and otherwise guide more sensitive development. In addition, this element recommends new programs and regulations, and provides a framework for coordination of existing programs for the purpose of making compliance as simple and equitable as possible. Finally, the environmental element recommends establishment of a comprehensive public education program to garner public involvement in and support of environmental projects and programs.

PROCESS: THE COMMUNITY'S PLAN

A concerted effort has been made to make certain that this Master Plan amendment reflects the desires of the citizens of Richmond. The document is the work of the Environmental Plan Advisory Committee appointed by the City Planning Commission and composed of members representing a wide cross-section of the community. As a result, the Advisory Committee represented a full range of ideologies from conservative business philosophy to strong environmental advocacy.

The Advisory Committee was carefully chosen to include members of Richmond's environmental groups and representatives of small business and industry, real estate and development, transportation, and each of the neighborhood teams. City department heads who will be directly responsible for implementation of the environmental element were also involved throughout the planning process to ensure full understanding and support of its recommendations.

The Committee spent eighteen months together investigating environmental issues, developing goals and objectives, preparing recommended policies and other actions, and reviewing them with the public and City officials prior to making final recommendations. The formal adoption process included several advertised public information meetings for public input to the draft document, review and recommendation by the City Planning Commission, and a final public hearing prior to approval by City Council.

The necessary research was conducted by the staff of the City's Department of Community Development aided by personnel from the Richmond Regional Planning District Commission and the Virginia Council on the Environment. Technical work included extensive research of the legal and regulatory framework at each level of government and compilation of data from existing City sources (including staff files, existing or in-progress reports by the City or consultants, and interviews of staff), State agencies, and other jurisdictions. Summary data and small scale maps are presented in this document; however, in most cases more detailed information and larger scale maps were used in the plan formulation process. Much of this data will be maintained by the Department of Community Development to aid in implementation of the environmental element.

PRINCIPLES

The environmental element is based upon several fundamental principles:

PUBLIC HEALTH
The City is responsible for protecting the public health, safety, and welfare. This responsibility is paramount in all decisions made which affect the environment.

ECONOMIC VIABILITY
A healthy and attractive physical environment is essential to the City's continued economic viability. Proper stewardship of land, water, and other elements of the environment is necessary to the maintenance of property values. Expedient actions oriented toward short term gain which do not properly conserve environmental resources for the long term should be resisted as detrimental to the public welfare.

LIVEABILITY OF NEIGHBORHOODS
Richmond is a desirable place to live in part because of the quality of its neighborhoods. Gradual erosion of this living environment through the cumulative impact of many small, but unwise, compromises erodes the quality of life and cannot be tolerated.

REASONABLENESS
A reasonable balance must be maintained between the commitment to environmental protection and economic realities. The cost of implementation should not be out of proportion to the environmental benefit, especially in cases where the benefit may be unclear or untested.

OVERVIEW

This environmental element is composed of eight additional chapters:

- A **Summary**, which includes a synthesis of environmental issues, environmental context, and goals and objectives;
- six chapters, one each for **Water Resources, Natural Features, Solid Waste, Air Quality, Noise, and General Issues** which contain background information, policy guidance, and recommended programs, actions, and physical improvements to be undertaken; and
- an **Implementation** chapter which summarizes policies and recommendations for each of the above issues.

SUMMARY

Chapter 2

INTRODUCTION

This chapter summarizes the environmental element, reviewing the major environmental issues addressed by the element: water resources, natural features, solid waste, air quality, and noise; general issues such as regulatory coordination, development of an environmental review process, and public education; environmental context including regulations and programs, population and economic conditions in the City, and land use and development. The chapter also summarizes goals and objectives developed by the Environmental Plan Advisory Committee and implementation mechanisms.

ENVIRONMENTAL ISSUES

Environmental issues have been divided into six groups to simplify their analysis and presentation: Water Resources, Natural Features, Solid Waste, Air Quality, and Noise. Highlights of environmental issues and recommendations are summarized below and treated in depth in each chapter under the headings highlighted in bold type. Within each group the issues are closely interrelated; many issues also strongly affect other groups, underscoring the fact that complete separation into such arbitrary categories does not truly reflect the unified nature of the eco-system.

WATER RESOURCES

Water resources affect nearly all aspects of the environment in a complex, integrated natural system. A complicated array of laws and programs seeks to address the many issues related to water quality and supply. A key recommendation of this chapter is to establish a mechanism for periodic evaluation and amendment of the City's **Current Water Quality Programs** to ensure proper coordination and consistency among programs, and to ensure that solutions incorporate changing technology and attitudes throughout the implementation process.

Most industries discharge their wastewater into the City's sewer system. The City has established a **pretreatment program** requiring those industries to treat wastewater prior to discharge into the public sewer system. This program was necessary to ensure that the sewage treatment plant meets its Virginia Pollutant Discharge Elimination System (VPDES) permit standards. In Richmond there are twelve VPDES permitted dischargers to surface waters, including the sewage treatment plant and various industries.

Combined Sewer Overflows (CSOs) constitute Richmond's most significant water quality issue. A CSO event occurs when large volumes of stormwater runoff exceeds the capacity of the combined sewer system causing raw sewage

mixed with stormwater runoff to be discharged into the James River. A **CSO Control Plan** has been developed and approved by the EPA and the State Water Control Board which will rectify the overflow problem.

The City's **Erosion and Sediment Control** regulations have required erosion control City-wide as part of the land development process since 1976. The **Chesapeake Bay Preservation Program** regulates development in designated Chesapeake Bay Preservation Areas. Within these areas certain performance criteria are required for the purpose of improving water quality. A more comprehensive stormwater control strategy/program is recommended in the **Stormwater Management and Drainage** section to better coordinate all stormwater quality and quantity efforts. A stormwater utility is recommended as a financing mechanism for stormwater control programs.

Soil and **Groundwater** contamination have resulted from a variety of sources which are addressed primarily in the Water Resources chapter. Of the approximately 7,000 underground storage tanks (USTs) which hold permits under the State UST program, only about two dozen require remedial measures or monitoring by the State. There are no Superfund sites in the City, but there are 12 less severely contaminated sites which are being monitored by the State Department of Waste Management.

Water supply is addressed in several sections of the environmental element. **In-Stream Flow** addresses the need for water withdrawal management to minimize adverse effects on designated beneficial uses such as domestic water supply, waste assimilation, and cultural, aesthetic, habitat, and recreation uses. **Water Conservation** recommends that the entire Richmond region employ water conservation techniques for the benefit all users of James River water.

Drinking Water Supply Protection is an issue of cooperation with other jurisdictions and careful land development practices to maintain surface water quality. **Drinking Water Quality** is excellent as it leaves the Richmond Water Treatment Plant, but is a problem in some homes and, perhaps, neighborhoods where lead or other contaminants may leech into the water from water pipes and other sources. Sampling and further study of the problem are recommended. A **Regional Approach to Water Issues** is needed to achieve reasonable consistency of regulatory programs to avoid imbalances within metropolitan Richmond and to deal with issues of in-stream flow, conservation, and water supply planning.

NATURAL FEATURES

Natural Features directly shape the urban environment of Richmond. Protection of these features is important to maintaining the quality of life within the City.

Two complementary efforts are recommended to preserve and enhance the **Urban Landscape**. A municipal landscape management program is proposed through which the City can better preserve and maintain vegetation, plant or replace trees and other vegetation, and establish means for citizens or organizations to participate in such efforts. A landscape ordinance is also recommended to enhance private development projects through design review and requirements to preserve vegetation, establish buffers, landscape parking lots, and provide other landscape improvements.

Preservation of **Urban Wildlife Habitat** is recommended as is development of a habitat management plan to identify particular areas of habitat which should be preserved, areas suitable for public access, development guidelines to aid in habitat preservation, and mechanisms for public support. **Urban Fisheries Management** is a similar area of concern in which a Fisheries Management Plan is proposed to expand fishing opportunities while providing for the maintenance and policing of fishing access points.

Environmentally Sensitive Areas needing special protection include wetlands, subaqueous bottomlands, soils of high erodibility, floodplains, and geologic features such as steep slopes. Various actions are recommended including identification of sensitive areas, incorporation of provisions to encourage their protection into development review processes, refinement of floodplain management tools to broaden their purposes, and integration of environmentally sensitive area protection into the proposed stormwater control strategy/program.

Urban Open Space enhancement and expansion are recommended through a park master plan which will reevaluate standards of adequacy and accessibility of the City's open space system, identify appropriate expansion opportunities, and propose new tools for funding and maintaining the system. Provision for public participation in the planning process and mechanism for private contributions of land, materials, labor, and other resources are recommended. Improved design standards for all public lands are recommended to enhance their value as part of the open space system.

An integral part of the expanded open space system is a proposed Greenways network being planned through the Metro Richmond Greenways project in cooperation with the National Park Service and other area jurisdictions. Continued City participation in the planning and implementation process is recommended.

River Protection and Enhancement is proposed through a series of recommendations to preserve the natural character of Richmond's shoreline where it exists while guiding development in limited Intensely Developed Areas. A conservation and management plan is proposed for the James River to evaluate its characteristics and develop conservation mechanisms. Recommended objectives include preserving and enhancing the free-flowing nature of the river, protection of views and scenic horizons, and protection of in-stream flow standards to support indigenous aquatic life and designated beneficial uses. Protection is recommended through improved use of existing land use authority, in conjunction with designation of a proposed Environmental Protection Area overlay to the City Land Use Plan.

Two significant tools are recommended under **General Land Use** to provide environmentally sensitive policy guidance and coordinated regulatory protection. An Environmental Protection Area overlay to the Master Plan is proposed to incorporate policy guidelines in appropriate areas directed toward protection of water quality, wildlife habitat, visual open space, and other environmentally sensitive features. A companion zoning overlay district is recommended to require plan review in these areas in order to accomplish these objectives.

SOLID WASTE

Proper disposal of municipal solid waste, hazardous materials, and special wastes is a problem of growing concern facing all levels of government. Disposal costs, potential environmental contamination, unnecessary consumption of natural resources, and human health hazards are all issues relevant to the disposal of solid waste. Implementation of an integrated waste management system which includes source reduction, reuse, recycling, resource recovery, incineration, and landfilling can contribute to the practical and environmentally sound disposal of solid waste.

Waste Reduction and Recycling are the most preferred components of the waste hierarchy because they divert waste from the solid waste stream. Recommendations include the provision of opportunities for residential and commercial recycling, development of markets for recyclable materials, and public education programs to encourage reduction, reuse, and recycling.

It is recommended that the Richmond region explore the feasibility of **Resource Recovery** as a means of separating recyclable materials from the waste stream, converting waste to energy, and reducing the volume of materials which must be landfilled. It is proposed that such a resource recovery program be explored through the Central Virginia Waste Management Authority. Landfilling is the least preferable disposal method from an environmental perspective, and it is recommended that the City concentrate on diverting waste from landfills and exploring alternative disposal methods. Identification of potential hazards from former landfill sites is also recommended.

Hazardous Materials and Special Wastes include both hazardous wastes and medical or infectious wastes. Mechanisms are proposed to regulate transportation and storage of such materials or wastes, to utilize only responsible carriers, and to hold shippers and carriers liable for clean-up costs resulting from any spill incidents.

It is recommended that the City support the solid waste management efforts of the Richmond Regional Planning District Commission and the **Central Virginia Waste Management Authority**. This would include the planning of an integrated waste system based upon the solid waste hierarchy and a comprehensive public education program.

AIR QUALITY

Vehicular Emissions contribute in large part to the City's nonattainment status. Much can be done at the local level as proposed including promoting the use of mass transit, employing the use of transportation system management and transportation demand management techniques, and converting to alternatively fueled vehicle fleets and buses.

It is recommended that the City adopt an energy policy statement to encourage **Energy Generation** methods which are clean and environmentally sound. It is also recommended that the City promote **Energy Conservation and Management** by incorporating innovative practices into City buildings, revising building codes to encourage the use of energy conservation techniques, and increasing public awareness of the need for energy conservation.

Clean Indoor Air is an issue which encompasses radon, sick building syndrome, and the Virginia Clean Indoor Air Act. Sick Building Syndrome results from the use of building materials and furnishings in tightly sealed buildings which have been found to contribute to health problems of occupants. It is recommended that the City not use materials

and furnishings which are known to contribute to sick building syndrome and begin a program of systematic replacement of such materials or improvement of ventilation systems where there are known problems. In addition it is recommended that the City implement the Clean Indoor Air Act by enactment of an ordinance prohibiting smoking in specified public buildings or buildings open to the public, and develop a mechanism for enforcement.

Electromagnetism is an issue over which there is currently great public debate as to whether or not the risk associated with prolonged exposure to electromagnetic fields is significant. It is recommended that scientific developments in the field be monitored and action be taken if appropriate.

Air Quality and Economic Development are interrelated in numerous ways as both the quality of the environment and environmental regulations affect private development decisions. Richmond, like nearly every major metropolitan area in the U.S., fails to meet the air quality standards of the Clean Air Act (CAA), and thus faces remedial actions as a nonattainment area. It is recommended that the City incorporate air quality considerations, including the impacts of CAA requirements, into its economic development strategy.

NOISE

Mitigation of noise is an important component of a comprehensive program to maintain the quality of urban living. There are many generators of noise, several of which can be controlled or influenced by the City.

Aircraft and Airport Noise can be influenced by directing flight paths away from residential and other sensitive areas. It is recommended that the City maintain a strong presence on the Capital Region Airport Commission to influence airport planning and decision making. Specific recommendations include review of existing and proposed flight plans to minimize impacts on noise sensitive land uses, consider such uses in any airport expansion plans, and require enforcement of the Noise Abatement Procedures by the FAA Richmond Tower.

The **Highway and Transportation Noise** section recommends consideration of noise impacts on sensitive land uses when planning new highways, adoption of a noise ordinance requiring developers to provide noise abatement for developments adjacent to highways, and consideration of the need for additional noise abatement measures for existing land uses. It is also proposed that the City adopt a truck route plan and regulations regarding mobile noise sources such as loud music and mufflers.

The **Neighborhood Noise** section recommends rigorous enforcement of the existing noise ordinance, amending existing land use ordinances to require noise sensitive site design in development review, and developing a public education program to inform citizens of the enforcement tools available to them.

GENERAL ISSUES

A number of general issues are presented in a separate chapter.

Regulatory Coordination is needed to coordinate and streamline City environmental programs and to ensure the efficient use of scarce resources throughout environmental compliance efforts. An **Environmental Review Program** is recommended to coordinate review of all City plans and programs to incorporate changing attitudes, technology, and environmental realities. A comprehensive **Public Education** program is recommended because so many efforts, such as recycling and water conservation, depend upon an informed and supportive public.

ENVIRONMENTAL CONTEXT

Regulations and Programs

In recent years a complicated array of regulations and programs has been promulgated at all levels of government to deal with environmental issues. A brief summary of these regulations and programs is contained in the Legal Appendix at the end of this document. The Legal Appendix provides a helpful framework for understanding the current status of such efforts as well as a context for this Master Plan environmental element.

Federal environmental law is made when Congress enacts legislation or the Environmental Protection Agency promulgates regulations. State environmental law is made when the General Assembly enacts legislation or when state agencies promulgate regulations pursuant to, and authorized by, underlying statutory law. Other forms of environmental law come into existence as an extension of the common law or through local ordinances adopted pursuant to authority explicitly grant by the State.

Population Dynamics

Begun as a trading settlement at the falls of the James River in the early 1600's, Richmond was a mature urban area well before the mid-nineteenth century. Richmond's population continued to grow into the 1960's both as a result of natural increases in population and through new development.

However, it was also during the 1960's that several factors combined to bring about a halt to new population growth. Land for new residential development became increasingly scarce. At the same time, the end of the "baby boom" and the subsequent fall in birth rates reduced the average household size.

In general, changes in the City's population between 1960 and 1990 mirrored trends experienced by many older central cities in the eastern United States. By the 1970's Richmond began to experience a significant decline in population as families with children began to leave the City for the suburbs. The last major land annexation, in 1972, temporarily slowed this population decline.

During the 1980's, the rate of decline gradually began to slow, and figures from the 1990 U.S. Census indicate that Richmond's population continues to decline, but at a much slower rate. As shown in the table below, the fall in average household size from 2.89 to 2.43 between 1970 and 1980 represents a drop of approximately 16%. Between 1980 and 1990, average household size fell from 2.43 to 2.25 a change of less than 7.5%, or less than half of the corresponding decline during the previous decade. This may indicate a stabilization of household sizes which will have positive implications for Richmond's future.

Environmental quality and the overall livability of neighborhoods is critical to both the retention of current residents and the attraction of newcomers. Typically, areas of the City experiencing the lowest rates of population decline are among the most environmentally appealing. Therefore, protection and enhancement of Richmond's environmental amenities is important to the future of the tax base.

Much of the City's increase in new housing units is occurring on scarce, developable tracts of land. Additional growth in the number of housing units is taking place through the redevelopment of previously developed properties. It is reasonable to expect an increase in this form of development.

It is essential that all future development reflect an increased sensitivity for the natural features of a site and surrounding neighborhoods. In addition, land use controls must ensure the appropriateness of use and good design practices and construction techniques which exhibit a sensitivity toward environmental features.

	1970	1980	1990
Total Population	249,621	219,214	203,056
Distribution by Age			
Under 5	19,065	13,258	13,965
5-19	66,832	44,711	35,165
20-29	40,685	49,925	40,290
30-39	25,468	27,706	35,039
40-49	29,129	18,546	22,183
50-59	28,009	21,359	16,224
60-69	22,192	21,373	18,331
70-79	12,908	14,227	13,982
Over 80	5,333	6,309	7,877
Median Age	29.5	30.4	33.2
Total Housing Units	87,083	91,527	91,850
Average Household Size	2.89	2.43	2.25

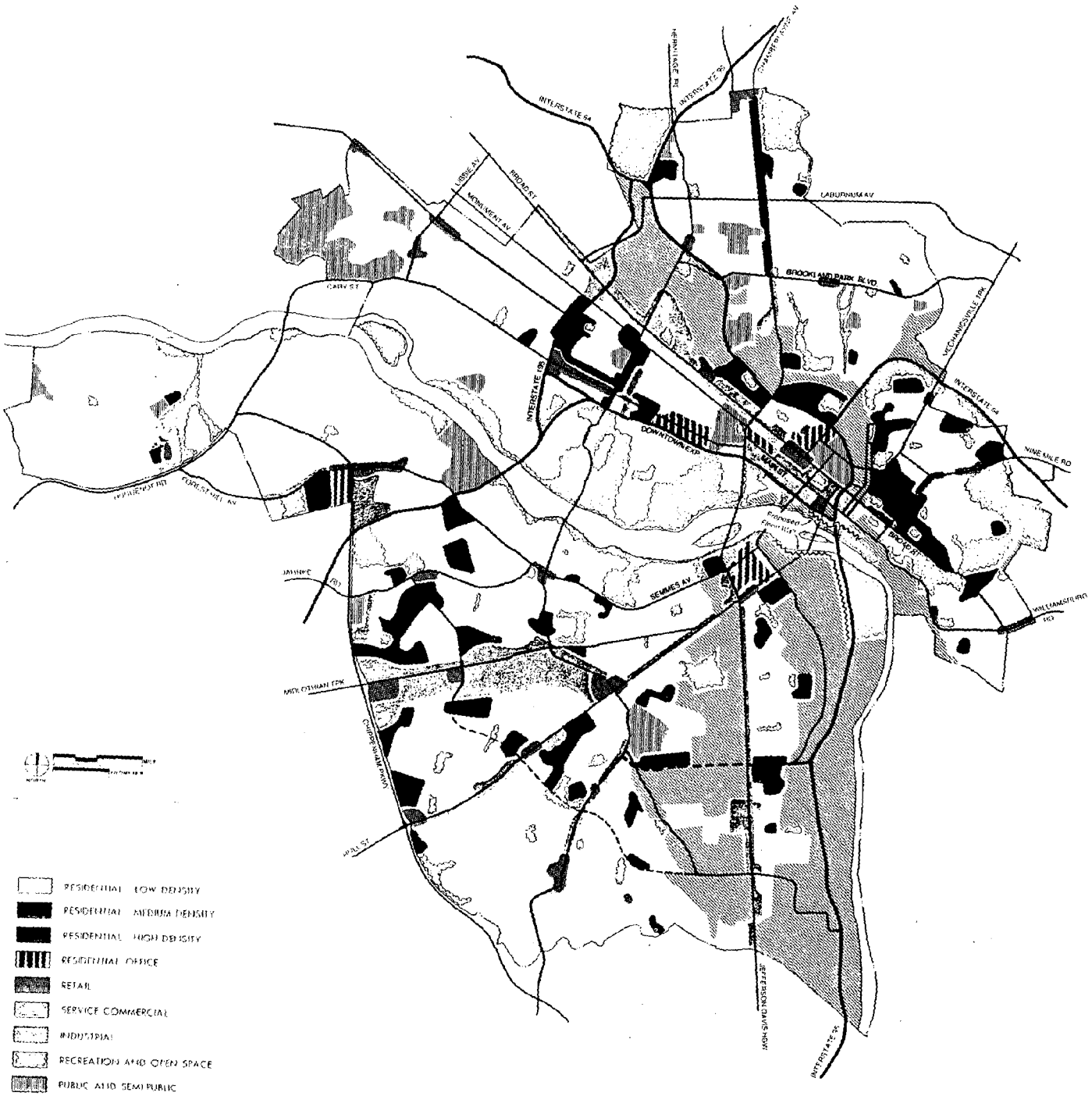
Land Use and Development

The City's Concept Plan was formulated as part of the City-wide revision of the Master Plan approved in 1983 which also includes detailed Land Use Plans for each of eight planning districts (see figure). There has not been a comprehensive amendment of the Land Use Plan since 1983 other than the Downtown Plan adopted in 1984 for the central business district. During the next several fiscal years, beginning July 1, 1992, the district Land Use Plans and the City-wide Concept Plan will be reevaluated and updated to reflect changing development patterns and new attitudes regarding the City's future.

Large scale development activity between 1983 and 1991 was not very widespread, occurring mostly in the southern and southwestern areas annexed from Chesterfield County in 1970. Most of the remaining developable land is scattered in these same areas and ranges in size from a few acres to approximately ten acres. Many of them are wooded and add much to the natural character of this part of the City. The most notable parcel is the large scale Stony Point project of approximately 527 acres adjacent to the south bank of the river. This mixed residential and commercial community is being developed in a manner which is generally sensitive to the natural features of the site. There are numerous small parcels, roughly under an acre in size, which have also been developed during this time frame resulting in a subtle, incremental reduction of the natural character of the City.

Potential redevelopment sites also exist, mostly in industrial districts along the Jefferson Davis Highway corridor, in the

concept **PLAN**



RICHMOND, VIRGINIA
NOV. 1982

FIGURE ____

areas to be protected by the floodwall, and in industrial areas north of the river near Downtown. These sites generally have already been previously developed and are not in a natural state. Such redevelopment often represents an opportunity to improve environmental quality through higher standards of design and development which are more sensitive than earlier construction.

There will undoubtedly be increasing pressure for development of the remaining unimproved land. This will result in conflicts between the need or desire of property owners to achieve economic returns versus the environmental qualities which may be lost by development. Conversely, in the case of redevelopment sites, opportunities are presented to improve upon existing conditions, both in terms of aesthetics as well as environmental values.

This document identifies environmentally sensitive features which are worthy of protection. Recommendations include measures to seek either the outright preservation of these features or the sensitive incorporation into development plans. One method of accomplishing this recommendation is implementation of a Land Use Plan overlay. A primary recommendation of the Natural Features chapter is the development of an overlay to current land use designations in the Master Plan, called an Environmental Protection Area. Its purpose is to seek protection of water quality, wildlife habitat, visual open space, and other natural qualities.

The Environmental Protection Area incorporates Chesapeake Bay Preservation Areas, adjacent sensitive lands, and may be expanded to include the greenway plan. The new overlay will be implemented through existing review processes and through a new zoning district which will require review of all development plans in these areas to seek sensitivity to these features following new policy guidelines.

GOALS AND OBJECTIVES

A goal is a general statement of a future condition which is considered desirable for the community; it is an end toward which actions are aimed. An objective is a statement of measurable activity to be accomplished in pursuit of the goal; it refers to some specific aspiration which is reasonably attainable. A recommendation is a specific proposal to do something that relates directly to accomplishing the objective; it identifies how an objective will be accomplished. Following are the goals and objectives formulated by the Environmental Advisory Committee.

WATER RESOURCES GOAL: THE CITY OF RICHMOND'S WATER RESOURCES SHOULD BE OF THE HIGHEST QUALITY AND AVAILABLE IN SUFFICIENT QUANTITIES.

WATER RESOURCES OBJECTIVES:

Current Water Quality Programs: Provide a planning process for periodic examination, evaluation, and amendment of adopted and proposed water quality related City plans and programs.

Stormwater Management and Drainage: Significantly improve the quality of stormwater which enters the James River and its tributaries from the City of Richmond through a balanced combination of volume reduction and stormwater treatment with an equitable allocation of public costs.

Groundwater: Protect the quality of groundwater in the City of Richmond through the regulation of land uses and implementation of pollution control measures.

In-stream Flow: Manage water withdrawals to reduce the impact on naturally occurring flows in the James River in order to minimize adverse effects on designated beneficial uses.

Water Conservation: Develop a water conservation program for the City of Richmond in conjunction with a regional cooperative effort.

Drinking Water: Continue to meet or exceed the requirements of the federal Safe Drinking Water Act as well as the Virginia State Board of Health Drinking Water Regulations.

A Regional Approach to Water Issues: Support regional water resource management.

NATURAL FEATURES GOAL: PRESERVE AND ENHANCE RICHMOND'S NATURAL FEATURES AND RECREATIONAL AMENITIES FOR THE ENJOYMENT OF ALL CITIZENS.

NATURAL FEATURES OBJECTIVES:

Urban Landscape: Promote the preservation and maintenance of existing vegetation and guide the planting of new vegetation for the purpose of improving the quality of development, improving the aesthetics of the City, providing habitat for urban wildlife, and minimizing stormwater runoff.

Urban Wildlife Habitat: Preserve, manage, and promote urban wildlife and wildlife habitat in a manner consistent with the resources and needs of the City.

Urban Fisheries Management: Promote the development and management of the James River and appropriate lakes and streams within the City as urban fisheries.

Environmentally Sensitive Areas: Identify, protect, and enhance environmentally sensitive areas within the City consistent with their role in the urban eco-system and contribution to water quality.

Urban Open Space: Ensure availability and access to open space, recreation, and natural areas for all citizens of Richmond through implementation of a master plan for parks and natural areas.

River Protection and Enhancement: Protect the recreational, aesthetic, and environmental attributes of the James River consistent with its role as a unique urban waterway.

General Land Use: Incorporate into the master plan additional land use policy guidance and into the zoning and other ordinances additional regulations to afford greater protection to environmental features consistent with the other objectives of this environmental element.

SOLID WASTE GOAL: THE AMOUNT OF SOLID WASTE PRODUCED IN THE CITY OF RICHMOND SHOULD BE MINIMIZED AND DISPOSED OF IN AN ENVIRONMENTALLY RESPONSIBLE MANNER, CONSISTENT WITH THE SOLID WASTE HIERARCHY.

SOLID WASTE OBJECTIVES:

Waste Reduction and Recycling:
Take action to reduce the per capita amount of residential solid waste produced in the City requiring disposal and to increase the level of commercial, institutional, and industrial waste reduction and recycling.

Resource Recovery: Promote combustion of municipal solid waste as a supplement to landfill disposal.

Hazardous Materials and Special Wastes: Take action to regulate the transportation, storage, and disposal of hazardous materials and special wastes (particularly hazardous, infectious, and radioactive wastes) within the City.

Central Virginia Waste Management Authority: Support and supplement the solid waste management efforts of the Richmond Regional Planning District Commission (RRPDC) and the Central Virginia Waste Management Authority (CVWMA).

AIR QUALITY GOAL: THE AIR IN THE CITY OF RICHMOND AND ITS ENVIRONS SHOULD BE OF THE HIGHEST QUALITY.

AIR QUALITY OBJECTIVES:

Vehicular Emissions: Promote activities which reduce the level of vehicular emissions and enhance air quality.

Energy Generation: Achieve clean and environmentally sound methods of energy generation.

Energy Conservation and Management: Implement energy conservation and management practices within City facilities and encourage their use throughout the City of Richmond.

Clean Indoor Air: Develop appropriate methods to eliminate the causes of sick building syndrome in City owned and operated facilities and to implement the Virginia Clean Indoor Air Act throughout the City.

Electromagnetism: Monitor the issue of Electromagnetism as scientific data is developed to determine if prolonged exposure to electric or magnetic fields, or both, represents a significant risk to public health, safety, and welfare.

Air Quality and Economic Development: Develop an economic development strategy which capitalizes on the advantages of a cleaner city while minimizing the disadvantages of being designated a nonattainment area by the Clean Air Act.

NOISE GOAL: THE CITY OF RICHMOND SHOULD ENSURE A SAFE AND HEALTHFUL ENVIRONMENT THROUGH THE MODERATION OF UNNECESSARY NOISE AND THE REDUCTION OF NOISE IMPACTS IN THE CITY.

NOISE OBJECTIVES:

Aircraft and Airport Noise: Ensure that all necessary steps are taken to mitigate the impacts of airport and aircraft noise on residential and other noise sensitive land uses in the City.

Highway and Transportation Noise: Ensure that all necessary steps are taken to mitigate the impacts of highway and transportation related noise on residential and other noise sensitive land uses in the City.

Neighborhood Noise: Promote activities which minimize noise levels in residential neighborhoods.

GENERAL ISSUES:

Regulatory Coordination: Coordinate the City's existing environmental programs and response to future regulatory requirements through an appropriate mechanism.

Environmental Review Program: Develop a review process for all proposed plans, programs, and development initiatives, whether publicly or privately generated, designed to ensure compliance with all applicable environmental regulations.

Public Education: Develop a comprehensive environmental education program for City residents, businesses, and industries.

IMPLEMENTATION OVERVIEW

Implementation of the environmental element of the Master Plan can be accomplished using the following mechanisms:

- Policies to guide decision making which are found throughout the chapters of this document;
- Land Use Plan amendments to guide land development and related activities; and
- recommendations which propose particular management and programatic activities; specific construction projects and improvements requiring expenditure of funds; and adoption of various ordinances, regulations and guidance documents.

These are found throughout this environmental element in each of the chapters and are summarized in the **Implementation** chapter at the end of the document.

WATER RESOURCES

Chapter 3

INTRODUCTION

Of all the environmental issues with which this element deals, water is perhaps the most all-encompassing. Its quantity and quality certainly are critical to the future of our entire eco-system. This section will provide an overview of the many issues, regulations, and programs involved as well as recommended actions for the City to pursue.

The Hydrologic Cycle

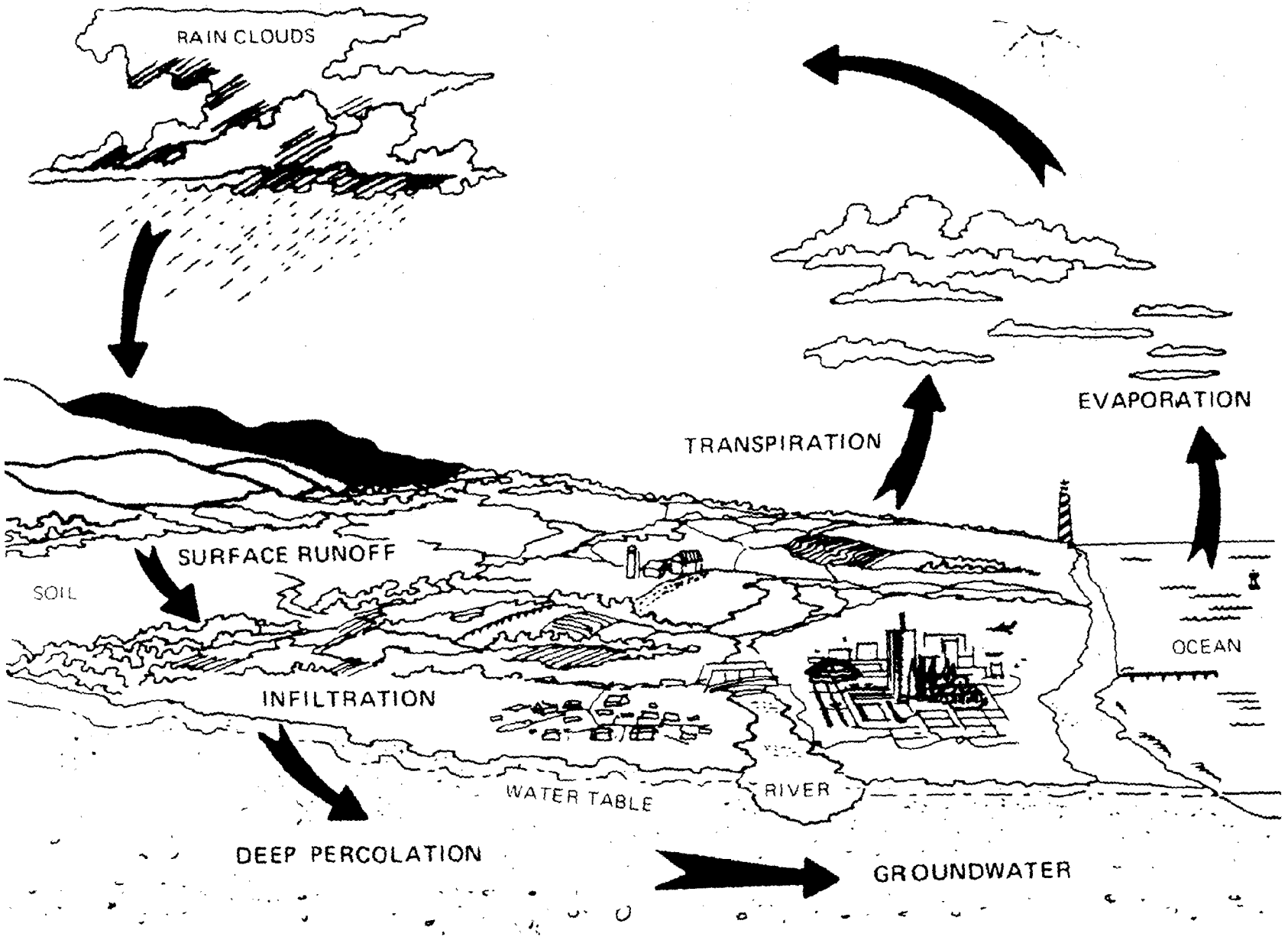
The supply and quality of water are affected by many interrelated factors. Water is constantly in motion above, on, and beneath the earth's surface, a phenomenon which is known as the hydrologic cycle. Clouds release moisture, either snow or rain, much of which evaporates before reaching the earth. Precipitation which does reach earth can moisten the soil at which point infiltration, or penetration of the water to deeper subsurface zones, may begin.

The rate at which water moves laterally and downward depends upon soil type, the amount of impervious surface, the amount and duration of precipitation, and the extent of vegetation. When the rate of precipitation exceeds the rate of infiltration, water flows over the land as surface runoff. Runoff and precipitation supply some of the water feeding streams, rivers, lakes, and oceans. Water that seeps downward to subsurface layers of soil and rock is called groundwater and provides approximately 30% of the annual flow of surface water bodies in Virginia.

Most of the water entering the soil returns to the atmosphere through evaporation or through transpiration, the process of plants taking in water through the roots and returning some of it to the atmosphere through the leaves. The hydrologic cycle is completed when the water returns to the atmosphere through a combination of evaporation and transpiration.

Opportunities for the degradation of surface and groundwater occur throughout the hydrologic cycle. Point source and non-point source pollution, leaking underground storage tanks, disposal and spills of hazardous materials or waste, and solid waste disposal facilities (primarily landfills) are all potential sources of contamination.

In Virginia, the cumulative result of has been a degradation of local water quality which has contributed to the gradual decline of the Chesapeake Bay as one of the most vital and economically productive marine resources in the nation. Programs which address the varied sources of contamination are extensive and span all levels of government. Implementation of these programs and improved development practices can halt this decline eventually leading to the restoration of the Bay and other water resources.



HYDROLOGIC CYCLE

FIGURE —

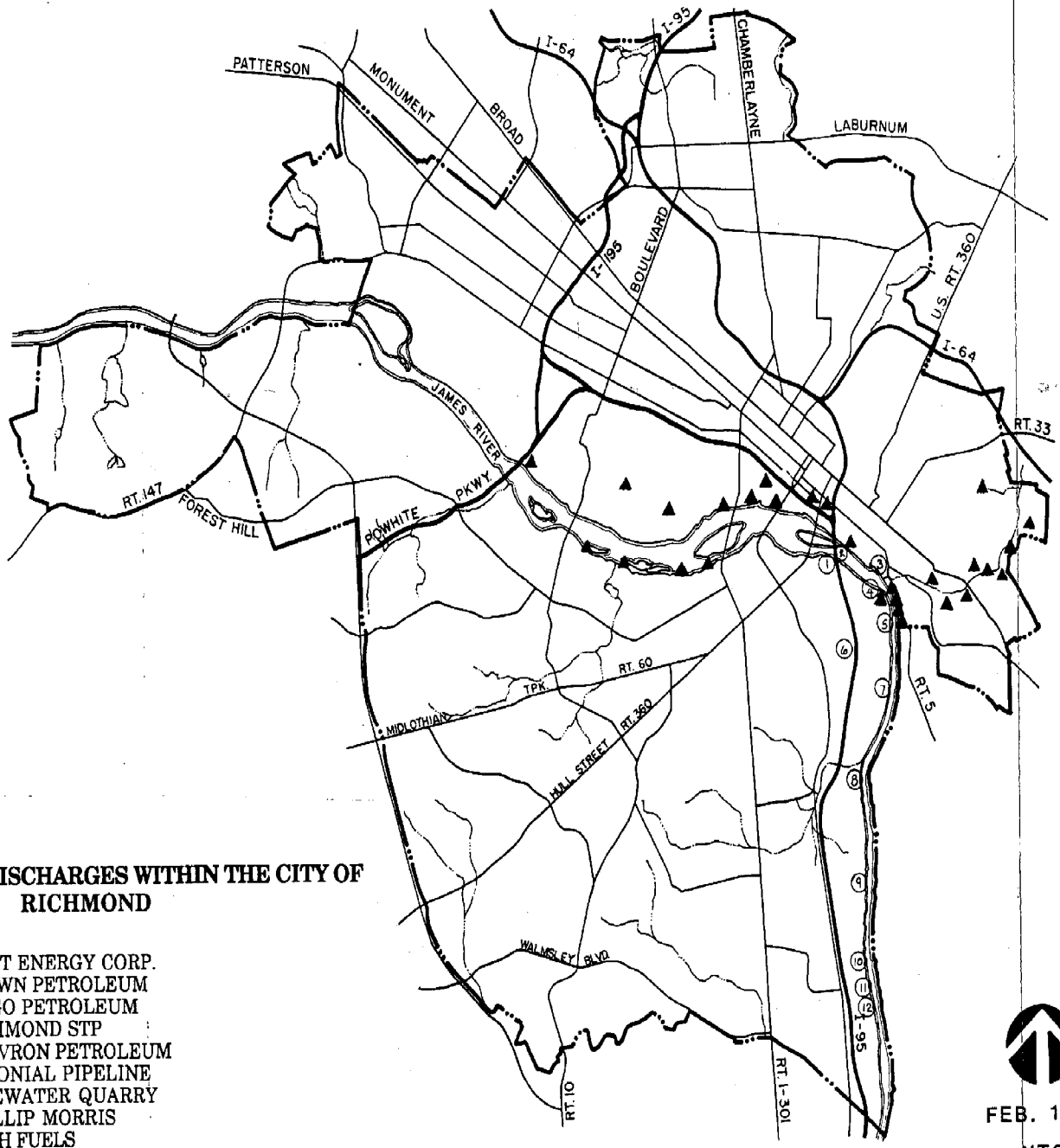
Federal Water Pollution Control Act Amendments
The Federal Water Pollution Control Act Amendments of 1972 were passed "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." To accomplish this, national programs were established to control two types of water pollution:

- Point source pollution coming from any "confined, discrete conveyance such as a pipe, ditch or outfall"; and
- non-point source pollution in the form of runoff from impervious surfaces, agricultural areas, mining operations, or other land disturbing operations.

Point source discharges are controlled through the use of National Pollutant Discharge Elimination System (NPDES) permits. In Virginia the program is administered by the State Water Control Board and the permits are called Virginia Pollutant Discharge Elimination System (VPDES) permits. These permits establish effluent limitations for each significant pollutant found in a point source discharge. The discharger must meet either federal technology based limitations for these pollutants or limitations based on Virginia's water quality standards, whichever is more stringent. These standards are established for each major manufacturing industry.

Any industries which discharge directly into State waters are required to have their own VPDES permits. In addition, publicly owned treatment works (POTWs) must obtain VPDES permits and are required to meet secondary treatment standards or limitations based on water quantity standards, whichever is more stringent. Currently there are only eleven permitted dischargers within the City limits, other than the City's sewage treatment plant (see figure).

NPDES Stormwater Regulations
In November 1990 EPA promulgated stormwater regulations pursuant to the Clean Water Act. The regulations require that NPDES permits be obtained for industrial land uses and storm sewer systems as well as the more traditional point sources. Storm sewer systems collect runoff, which has been considered non-point source pollution in the past, and discharge it at a point, or points, thereby converting the non-point source discharge into a point source discharge. The regulations require that certain cities develop strategies for monitoring and, potentially, treating stormwater prior to discharge. The regulations also require that local governments prepare plans for management of stormwater.



POINT SOURCE DISCHARGES WITHIN THE CITY OF RICHMOND

1	FIRST ENERGY CORP.
2 &3	CROWN PETROLEUM
4	CITGO PETROLEUM
5	RICHMOND STP
6	CHEVRON PETROLEUM
7&9	COLONIAL PIPELINE
8	TIDEWATER QUARRY
10	PHILLIP MORRIS
11&12	KOCH FUELS
▲	RICHMOND CSO's

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Application of the requirements to the City's stormwater collection system is an extremely complicated matter which is under detailed study. The City began developing a plan for compliance in 1991 with precise requirements and the timetable for implementation to be determined.

Clean Water Act Reauthorization

As of October 1990, more than 11,000 CSO outfalls had been identified in 30 states throughout the country. The EPA has estimated that it will cost roughly $80 billion to eliminate these outfalls. Reauthorization of the Clean Water Act is currently being considered by Congress and is expected to be approved in 1992 or 1993. Alternative forms of the legislation are being sharply debated; however, regardless of the final version, the Act is anticipated to include essentially four elements: CSO Inventory, Elimination Programs, Elimination Guidance, and Program Development Aid. Additional mandates appear likely, potentially including water conservation, site design, on-site retention, and possibly separation of storm and sanitary sewers.

The City of Richmond is participating in a consortium of cities with CSO problems called The CSO Partnership. The Partnership is supporting a version of the Act which would approach CSOs as site specific problems with state controlled individual solutions to each city's particular needs and financial resources, rather than a rigid national standard with uniform solutions. This version of the Act stresses the need for flexibility and cost-effectiveness in the implementation of CSO controls and provides for grant funding on the basis of financial need and water quality benefit.

Virginia Erosion and Sediment Control Law

The Virginia Erosion and Sediment Control Law of 1973 seeks to provide control of soil erosion, sediment deposition, and non-agricultural runoff to prevent the degradation of state waters. It is administered by local governments, and regional soil and water conservation districts.

GOAL

THE CITY OF RICHMOND'S WATER RESOURCES SHOULD BE OF THE HIGHEST QUALITY AND AVAILABLE IN SUFFICIENT QUANTITIES.

CURRENT WATER QUALITY PROGRAMS

OBJECTIVE

PROVIDE A PLANNING PROCESS FOR PERIODIC EXAMINATION, EVALUATION AND AMENDMENT OF ADOPTED AND PROPOSED WATER QUALITY RELATED CITY PLANS AND PROGRAMS.

Pretreatment Program

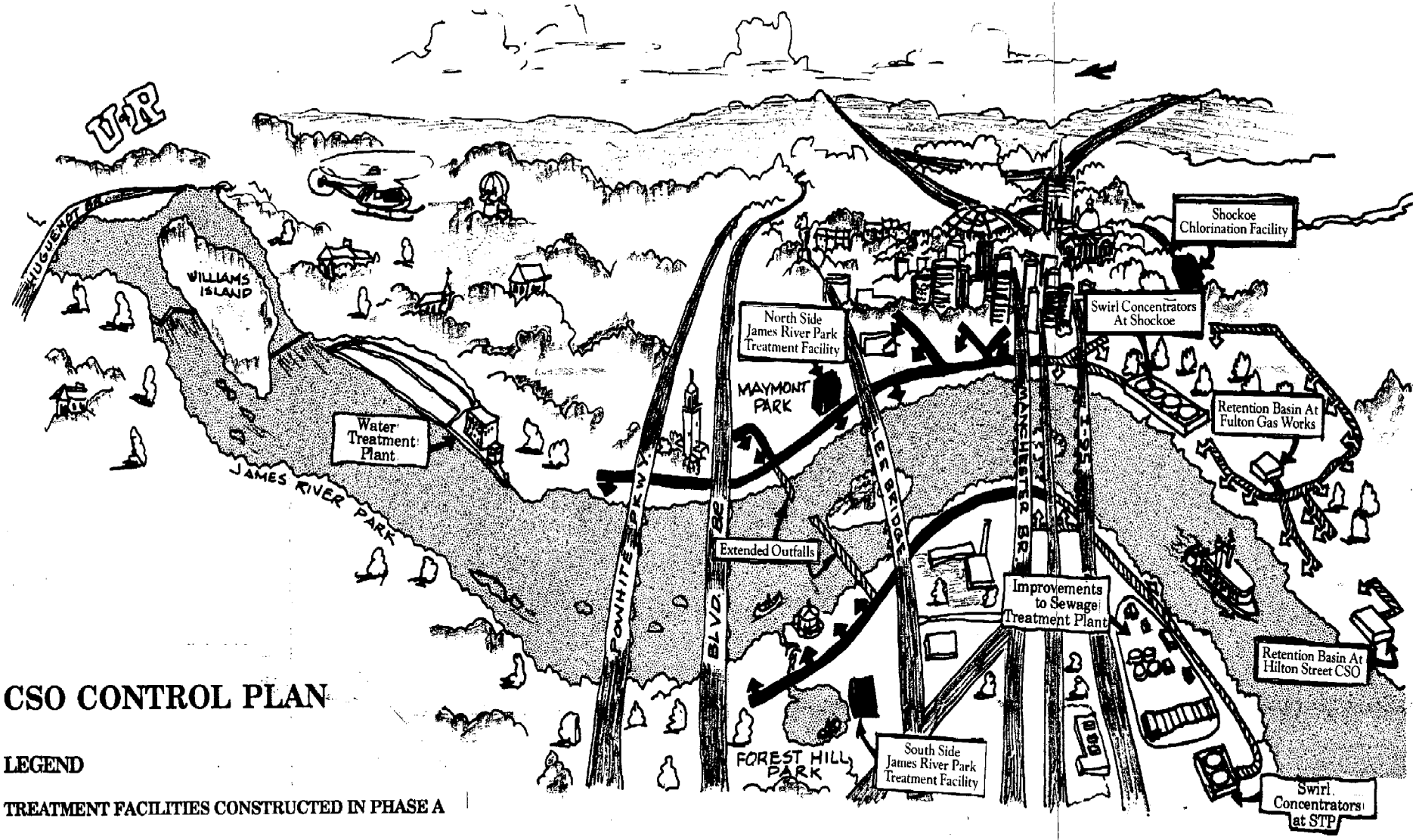
Most industries located in the City discharge their wastewater into the public sewer system. The City has established a pretreatment program which requires many industries specified by the City and the EPA to treat their wastewater before discharging into the City sewer system. This program was necessary for the sewage treatment plant discharges to meet standards required under its VPDES permit. It is not realistic or economically feasible for the plant to treat all of the pollutants which are released by industries in the City.

Businesses operating under pretreatment permits are monitored three to four times per quarter for continued compliance with the standards. Of the 66 permitted dischargers in January, 1992, five were experiencing periodic difficulty in maintaining permit standards. The City Department of Public Utilities (DPU) works closely with permitted dischargers to aid them in meeting the standards and has a program to identify dischargers who are not currently permitted but should be.

In 1992 DPU will be reevaluating the permissible release standards for all dischargers into the system. It may be necessary to tighten the pretreatment standards for several pollutants to stay within the treatment plant's VPDES discharge requirements. This potentially may require some new or existing dischargers to treat their discharges or treat them to a higher standard.

CSO Control Plan

The City of Richmond, like many older urban areas, has a combined sewer system which serves approximately one third of the City. Both stormwater and sanitary sewage flow through the system to the sewage treatment plant. Most of the time this configuration is not a problem; however, during rainy weather the amount of water carried by the combined sewer can exceed capacity and the untreated effluent can be discharged directly into the James River. There are 32 Combined Sewer Overflow (CSO) points which may discharge into the river depending upon the amount of rainfall (see figure).



CSO CONTROL PLAN

LEGEND

- TREATMENT FACILITIES CONSTRUCTED IN PHASE A
- CSO'S ADDRESSED IN PHASE B
- PIPELINES CONSTRUCTED IN PHASE B
- TREATMENT FACILITIES CONSTRUCTED IN PHASE B
- CSO'S ADDRESSED IN PHASE C
- PIPELINES CONSTRUCTED IN PHASE C
- TREATMENT FACILITIES CONSTRUCTED IN PHASE C

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FIGURE _____

The combined sewer system overflows into the James River approximately 80 times per year, usually during the rainy summer months. The overflow points are concentrated in the James River Park area and in the downtown area of the riverfront. In order to alleviate this problem, the City has prepared and adopted a CSO Control Plan which has met EPA and State approval.

The first phase of the CSO Control Plan, completed in July 1991, involved $74 million in improvements to the sewage treatment plant including tertiary treatment capability. The next phase will take 12 years to implement and will accomplish the conveyance of CSO discharges further downstream where human contact is less likely. Swirl concentrators will be constructed at several points to provide some treatment of the effluent prior to discharge during a CSO event. Future phases will involve construction of additional conveyance structures and treatment facilities including swirl concentrators, chlorination and dechlorination facilities, and retention basins.

Erosion and Sediment Control

The City of Richmond administers an erosion and sediment control program through its Floodplain Management Ordinance which is administered by the Department of Community Development. The erosion and sediment control requirements have been expanded to include all land disturbing activities of 2,500 square feet or more (formerly 10,000 square feet) within the recently adopted Chesapeake Bay Preservation Areas (see figure).

Chesapeake Bay Preservation Program

Pursuant to the Chesapeake Bay Preservation Act adopted by the Virginia General Assembly in 1988, the City of Richmond adopted its Chesapeake Bay Preservation Program in November, 1991. In the form of amendments to the City's Zoning Ordinance, Subdivision Ordinance and Floodplain Management Ordinance, the program enacts specific local requirements for the purpose of improving water quality. The City's program is consistent with the State requirements as contained in the Act and regulations promulgated by the Chesapeake Bay Local Assistance Board (CBLAB).

As stated in the regulations, the purpose of the program is to protect or improve the quality of the waters in the Chesapeake Bay and its tributaries by regulating development in a manner which will "minimize non-point source pollution from stormwater runoff, minimize erosion

and sedimentation, reduce the introduction of nutrients and toxics in to state waters affecting the Chesapeake Bay, maximize rainwater infiltration, and ensure the long-term performance of the measures hereby employed while recognizing the needs of the public and property owners to develop property in a reasonable and orderly fashion."

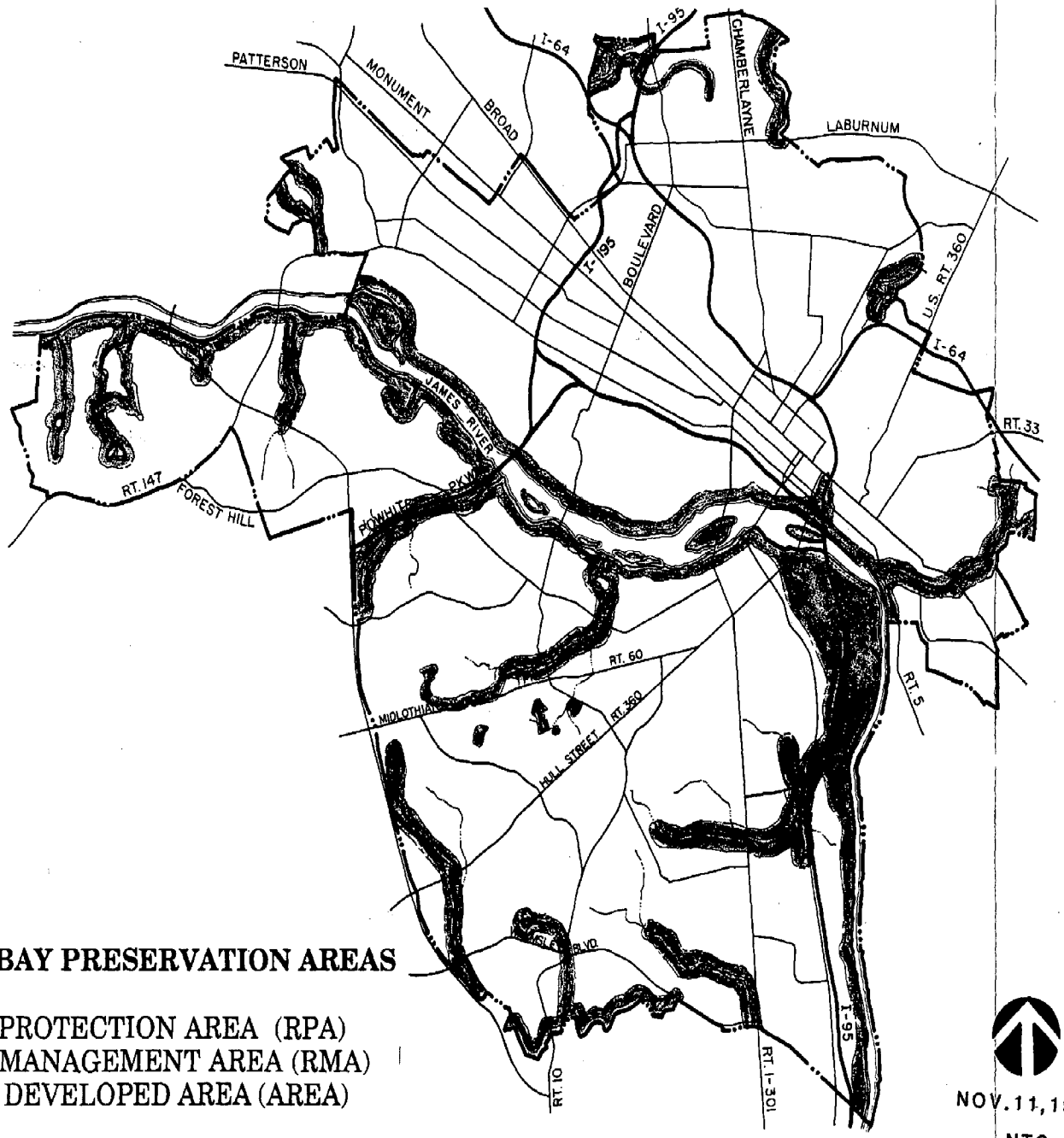
The program established the following categories within the Chesapeake Bay Protection Areas (CBPAs):

1. Resource Protection Area (RPA) consists of lands located "at or near the shoreline" of the James River and tributary streams that have an intrinsic water quality value due to the ecological and biological processes they perform. The RPA consists of the following:

   - tidal shores
   - tidal wetlands
   - certain non-tidal wetlands, and
   - a 100' buffer area adjacent to the above features and all tributary streams.

   In these areas the regulations prohibit all development except for water-dependent uses, historic preservation activities and essential roads, utilities and similar structures. Submission and approval of both a Chesapeake Bay Site Plan and a Water Quality Impact Assessment is required for development within an RPA. Best Management Practices must be incorporated to reduce and filter runoff and must also comply with the related provisions of the City's erosion and sediment control regulations for all land disturbing activities. Approximately 3% of the City's land area lies within the RPA.

2. Resource Management Area (RMA) includes all lands within 500 feet of the landward boundary of the RPA, the 100 year floodplain and certain other wetlands not included in the RPA. Generally, these properties drain into the RPA and, if improperly used or developed, have a potential for causing significant water quality degradation. Best Management Practices may also be required within the RMA. Newly developed sites cannot exceed the NPS pollutant load for the watershed in which they are located, while redeveloped sites must achieve at least a 10% reduction in the existing or pre-development NPS pollutant load for the specific site. Approximately 16% of the City's land area lies within the RMA.



CHESAPEAKE BAY PRESERVATION AREAS

- RESOURCE PROTECTION AREA (RPA)
- RESOURCE MANAGEMENT AREA (RMA)
- INTENSELY DEVELOPED AREA (AREA)

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3. The Intensely Developed Area (IDA), consists of areas where "little of the natural environment remains." Within IDAs redevelopment and the development of infill parcels is permitted. This allows flexibility for certain sites adjacent to the river to be redeveloped in a manner which is consistent with the goals of the Act. Work proposed within the IDA must meet the 10% pollution reduction and other water quality standards for redevelopment areas. The City's IDA is found primarily in the downtown area adjacent to the James River and the canals.

All development within Chesapeake Bay Preservation Areas must comply with the following performance criteria:

- Minimization of land disturbance;
- preservation of indigenous vegetation;
- minimization of impervious cover, such as paving and roofs;
- maintenance of best management practices;
- erosion and sediment control ordinance compliance required;
- site plan review required; and
- septic system pump out required (every 5 years).

In some urban situations it is difficult to provide the required reduction in non-point source pollutant load. One means of complying with the performance criteria which has yet to be fully developed is the use of off-sets. An off-set would use a second, unrelated site for the placement of a BMP when it is not feasible to place a BMP on the project site. In order to achieve the desired water quality improvements in a particular watershed, use of off-sets should be restricted to sites within the same watershed as the project site. An evaluation of potential off-set sites, or receiving areas, throughout the City must be made prior to implementing such a program.

The environmental planning process has not precipitated any immediate changes to the adopted Chesapeake Bay Preservation program; however, it has created a more unified context for administration of the program.

Recommendations

This element supports the City's position that the Combined Sewer Overflow (CSO) problem should be dealt with on a city-specific basis rather than with the development of national standards for CSO control. It is also recommended

that a long term solution be sought that relies upon stormwater retention on individual properties and in neighborhood retention facilities rather than upon massive construction. Such a solution is consistent with the philosophy and practices already being implemented in the erosion and sediment control program, the Chesapeake Bay Preservation Program, and in the new stormwater management programs being promoted by the State and Federal governments.

A. Reevaluate the current CSO Control Plan on a periodic basis to allow for the most cost effective, environmentally sound, and acceptable methodology for complying with regulatory requirements and City objectives. Such reevaluation should consider the following:

   1. Evaluation of the potential effectiveness of source controls throughout the CSO area, particularly with respect to the two remote CSO outfalls which will be expensive to connect with the proposed conveyance system.

   2. New legal requirements that might affect, or conflict with the current approach.

   3. Changing technologies and review of existing technologies, including effectiveness of chlorination and dechlorination processes.

   4. Changing costs.

   5. Effect on downstream water quality.

   6. Changing public preferences, priorities, and commitments.

   7. Examination of the aesthetic issues of the plan (i.e. location, placement, and design of facilities and their compatibility with existing structures and the natural environment).

   8. Impact on areas of historical and archaeological significance including canal preservation before, during, and after construction of facilities.

B. Ensure compliance with National Pollutant Discharge Elimination System (NPDES) stormwater requirements for all City-owned facilities.

C. Monitor the administration and effectiveness of the Chesapeake Bay Preservation program to continuously evaluate the need to modify the designated Chesapeake Bay Preservation Areas and adopted ordinances.

D. Consider expansion of the designated Resource Management Area (RMA), based on the changing regulatory environment, available information, and other issues.

E. Incorporate a plan for open space off-sets into both the Chesapeake Bay Preservation program and the proposed stormwater control strategy/program.

1. Evaluate a system of off-sets for open space which will serve as an option for meeting the stormwater management requirements of the RMA.

2. Target off-set receiving areas within each watershed which facilitate the creation of open space within the goals of the City Master Plan.

F. Incorporate appropriate components of the Chesapeake Bay Preservation program into the City-wide stormwater control strategy/program.

STORMWATER MANAGEMENT AND DRAINAGE

OBJECTIVE
SIGNIFICANTLY IMPROVE THE QUALITY OF STORMWATER WHICH ENTERS THE JAMES RIVER AND ITS TRIBUTARIES FROM THE CITY OF RICHMOND THROUGH A BALANCED COMBINATION OF VOLUME REDUCTION AND STORMWATER TREATMEMT WITH AN EQUITABLE ALLOCATION OF PUBLIC COSTS.

Stormwater is precipitation which flows over land surfaces and enters into the sewer system or other drainage systems. The pollutant level in stormwater is usually highest at the beginning of the wet season or at the beginning of a rain since pollutants have accumulated over time during the dry periods.

Storm drains collect and discharge rain and snow runoff which has picked up pollutants from a wide variety of diffuse (or non-point) sources such as oil and grease from roads and parking lots; pesticides and fertilizers from lawns; de-icing salts and chemicals from roads and airports; metals and other contaminants from industrial sites; and sediment from construction sites. Runoff containing these materials is typically released directly into rivers, streams, lakes, wetlands, and coastal waters posing threats to drinking water, aquatic life, and the recreational uses of those waters.

Historically, stormwater management has been limited to the planning, design, and implementation of stormwater quantity drainage improvements. Water quality controls were not required. The objective was simply to follow good engineering practices in building drainage systems to pipe the water off-site as efficiently as possible and into a stream or into the municipal storm sewer system.

During the 1970's and 1980's several state and federal laws and regulations were enacted which expanded local government responsibility for stormwater management to include the control of stream erosion, flooding, and water quality problems caused by urban drainage. These programs include the Virginia Erosion and Sediment Control Law, the Chesapeake Bay Preservation Act, the Virginia Stormwater Management Act, and the EPA's stormwater discharge permitting regulations under the National Pollutant Discharge Elimination System (NPDES) program.

Localized Flooding

Stormwater drainage problems are located in a variety of places throughout the City of Richmond. The majority are found on the southside of the City, particularly in the area annexed from Chesterfield County. Generally these are caused by development which increases impervious surfaces and, therefore, larger volumes of runoff which cannot be handled by existing drainage systems.

In 1970 the City commissioned a study, updated in 1983, which identified 13 problem areas and associated remedial measures. The 13 problem areas have been grouped together and prioritized according to severity, with priority one representing the most serious problems such as roadways covered by flood water and priority five/six being problems of a much smaller scale. The estimated costs of remediating each "priority group" follows:

PRIORITY GROUP	ESTIMATED COSTS
One	$2.4 million (completed)
Two	$5.8 million
Three	$6.3 million
Four	$10.0 million
Five/Six	$4.0 million

Currently remediation of these areas is being funded at roughly $900,000 per year, at which rate it will take nearly 30 years to complete all priority groups. The areas north of the river require mainly upgrading and repairing of existing facilities such as drainage ditches and storm sewers. South of the river remediation measures are much more extensive and include channel improvements and upgrading culverts underneath roadways.

Reedy Creek

In addition to the six priorities stated above, Reedy Creek is another drainage problem that has been separately identified and prioritized. To date the City has spent approximately $12.5 million channelizing Reedy Creek from Forest Hill Park to Roanoke Avenue. Channelization remains to be done from Roanoke Avenue to Midlothian and German School Road. Progress is very slow due to funding constraints; however, the City is obligated by a court order to upgrade Reedy Creek in order to relieve flooding in the shopping center at that location as a result of a suit in the 1970's.

During the development of the environmental element the necessity and desirability of channelizing Reedy Creek was questioned. Therefore, it is recommended that the City review its plans for Reedy Creek flood relief to determine if there are alternative solutions to that currently being implemented which can satisfy the need for flood relief within the environmental context of this element.

Stormwater Control Strategy/Program

It is recognized that the cumulative effect of stormwater-carried pollutants is very damaging to water quality which has led to a series of regulations and programs at the State and Federal levels. This element recommends that the City consolidate all of its stormwater related efforts into a single, forward-looking program which satisfies the performance requirements of all the regulations while streamlining the process.

The proposed stormwater control strategy/program should accomplish the following:

1. Coordinate compliance efforts between agencies to minimize duplication;

2. consider solutions more in tune with the natural systems around which this plan is built as an alternative to or in concert with structural engineering solutions; and

3. periodically review compliance solutions to incorporate changing technology, attitudes, and environmental realities.

Stormwater Utility

The ability of local governments to generate enough money to cope with water quality issues is particularly critical to the success of stormwater management programs. The Virginia Revolving Fund Loan Program makes loans available below market interest rates for non-point source pollution control projects; however, typically construction and on-going stormwater management costs far exceed the ability of most

local governments to adequately fund the new initiatives through traditional funding sources.

The stormwater utility is an innovative financing alternative which involves designating stormwater management as a utility (similar to water, gas, and electricity) for the purpose of reallocating the cost of local stormwater management programs through a monthly or quarterly user fee assessed to all property owners. The stormwater utility is a financing option which has been popular in the western and midwestern United States for the past 15 years. Now, with increased pressure, eastern states are beginning to use this technique, the first being implemented in Tallahassee, Florida in 1986.

Legislation enacted during the 1991 session of the Virginia General Assembly authorizes municipalities to establish a utility or enact a system of service charges. Income derived from service charges may not exceed the actual costs incurred by a municipality and is to be used to recover costs associated with the planning, design, land acquisition, construction, operation, and maintenance activities.

The charges may be assessed to all property owners based upon their contributions to stormwater runoff. A waiver is required for governmental agencies that own and maintain storm drainage and stormwater control facilities. The legislation also authorizes the issuance of general obligation bonds or revenue bonds in conformance with existing law, collection of interest on overdue accounts, placement of liens on property and entrance into multi-jurisdictional arrangements.

A stormwater utility relies on a system of user fees in proportion to stormwater discharges into the public drainage system. Typically, the square footage of impervious surface is reflected in the base unit for the user fee, because the amount of impervious surface is a common indicator of stormwater runoff and pollution discharge potential. This method is more equitable than reliance on general fund revenue because the fee is assessed to each parcel of land based upon its usage of the drainage system rather than on property value.

The most common user fee structures are built upon the single family residential unit with all other uses (such as multifamily, institutional, commercial and industrial) expressed as ratios related to the single family unit. Very sophisticated formulas can be used to make the system as fair as possible, both between residential and non-residential uses and within the residential categories (e.g. single family and varying densities of multi-family).

New development can be required either to construct stormwater management facilities that meet runoff quality and quantity control requirements or pay an up-front fee to participate in regional or basin-wide stormwater management facilities.

Retrofitting of existing development requires significant capital, for which two options for cost recovery are available:

1. Including an annual capital improvement program in the rate base so that the overall integrity of the system is the responsibility of the entire community; and

2. levying a special assessment on customers served by a specific element of the system in proportion to their use of the facility.

Finally, the stormwater utility is a user fee system that integrates all user classes (residential, commercial, industrial, and platted vacant land) into a fair and equitable rate structure which can generate ongoing revenue from monthly user fees and permit fees. The revenue earned from the implementation of a stormwater utility is dependable, renewable (because it is not in competition with general fund needs, such as social services or law enforcement), and leveragable (revenue bonds).

The revenue generated by user fees makes it possible to phase out general fund contributions to local stormwater programs. As a result, local public works departments have adequate resources to construct stormwater management facilities, to perform maintenance activities, and to administer expanded stormwater maintenance programs to meet state and federal regulations.

Recommendations

It is recommended that a unified stormwater control strategy/program be established for the purpose of efficiently meeting the City's current responsibilities, addressing the coordination of City programs, and evaluating the impacts or requirements of pending legislation.

In addition, the City is currently working toward development of a strategy for compliance with the NPDES stormwater requirements of the 1987 Clean Water Act Amendments. Development of a stormwater utility is anticipated as a potential financing mechanism for implementation of the system ultimately proposed.

A. Develop a City-wide stormwater control strategy/program which focuses on the reduction of stormwater entering the City drainage system at the point of origin and incorporates the following elements:

1. Integrates all stormwater regulatory requirements and City goals.

2. Utilizing existing permit review processes, require that all development projects assume responsibility for stormwater runoff either through incorporation of measures on-site, participation in a City-wide stormwater utility program, or an appropriate combination of both.

3. Flexibility and equivalency to utilize off-sets where BMPs or remediation measures are not feasible on a particular site.

4. Use retention ponds and other structural BMPs, such as detention storage facilities, in floodplains provided this does not adversely affect existing beneficial floodplain values.

5. Encourages the use of permeable paving, perforated paving blocks, and other innovative mechanisms for addressing traditionally impervious areas where appropriate and applicable.

6. Assigns an equitable share of City-wide stormwater treatment costs and provision for an opt-out from imposition of a portion of these costs where on-site stormwater control mechanisms (BMP's) are incorporated.

7. Promotes the development of regional or neighborhood stormwater management facilities.

8. Promotion and funding of non-structural BMPs for publicly owned spaces and facilities which improve the quality of stormwater runoff, such as leaf collection and street cleaning.

9. Coordinate compliance efforts between agencies to minimize duplication of effort and increase efficiency.

10. Periodically review compliance solutions to incorporate changing technology, attitudes, and environmental realities.

B. Develop City-wide stormwater treatment and volume reduction measures which incorporate the following:

1. Seek remedial solutions for existing problem situations such as flooding, erosion, and non-point source pollution.

2. Establishes requirements for retention or creation of permeable cover for development.

3. Incorporates model urban stormwater management practices into new public development projects using available leverage or control.

4. Promotes landscape management practices which limit the use of fertilizers and pesticides.

5. Continues to fund and/or promote City-wide BMPs which improve the quality of stormwater runoff such as used oil recycling programs, leaf collection, street cleaning, sewer maintenance, and on-site or neighborhood structural or non-structural facilities.

C. Create a stormwater utility to implement the proposed stormwater control strategy or program and assess equitable user fees to cover the cost of such a program.

1. Incorporate within the stormwater utility the assignment of costs or "rates" based upon the extent to which an activity or land use contributes to stormwater runoff.

2. Include credit provisions in the stormwater utility program so that property owners who have implemented stormwater control facilities are charged according to their actual generation of stormwater runoff.

D. Establish a citizens advisory committee to advise the Utility Director, City Manager and the City Council in all matters regarding the implementation of the stormwater control strategy/program. This committee should have broad-based representation.

GROUNDWATER

OBJECTIVE
PROTECT THE QUALITY OF GROUNDWATER IN THE CITY OF RICHMOND THROUGH THE REGULATION OF LAND USES AND IMPLEMENTATION OF POLLUTION CONTROL MEASURES.

The City of Richmond is situated on the fall line, a zone characterized by an abrupt change between the piedmont region to the west and the coastal plain to the east. The fall line runs in a north/south orientation roughly aligned with I-95. Several groundwater aquifers originate at the fall line and flow in an easterly direction underneath the coastal plain. The fall line is an important water recharge zone for these aquifers. Land use activities can adversely impact

groundwater quality and thus might affect the aquifer which is the water supply source that serves several tidewater Virginia localities. In addition, because groundwater contributes to the flow of the James River and its tributaries, groundwater can also contribute pollutants by its slow migration to the river.

A stratum of impermeable clay, which varies from approximately twenty to forty feet below the surface, can be found beneath much of central and eastern Richmond. This clay separates the shallow groundwater from the deeper aquifers underneath. Contaminants from many sources over the years have affected much of the shallow groundwater in the older commercial and industrial areas of the City. There are ____ cases of known soil contamination where pollutants have migrated to the river via the groundwater (see figure).

Contamination of groundwater is discussed in four primary categories:

- Underground Storage Tanks (USTs) for petroleum or other substances.
- Sites where soil has been contaminated by hazardous materials spills (CERCLIS sites, discussed in the Solid Waste chapter).
- Solid waste disposal or handling facilities, primarily landfills.
- Miscellaneous sources such as non-point source pollution from surface runoff.

Although some degree of groundwater contamination may be present in many parts of the City, severe contamination is not known to be widespread. Administration of the existing programs described below and the additional studies proposed, will contribute to a more complete understanding of the present quality of groundwater in the City and how best to maintain or enhance that quality.

Underground Storage Tanks

Underground petroleum or chemical storage tanks constitute potential threats to groundwater due to leaks or accidental spills. The Virginia Underground Storage Tank Program, authorized under Articles 9 and 10 of the Water Control Law, provides for the regulation of underground storage tanks (USTs). This program requires registration of tanks over 5,000 gallons with the State Water Control Board and provides for the phased upgrade of all old tanks, strict controls on new tanks, and funding for the cleanup of leaking tanks.

The law requires periodic inspection of tanks, upgrading to prevent spills and repair or replacement of leaking tanks. Mandatory replacement of older tanks by non-corrosive tanks with spill preventers and other safety features is required to occur by 1993. The City is responsible for the permitting of the installation and removal of underground storage tanks under the UST program. Installation permits are administered by the Office of Building Inspection, Mechanical Department, and removal permits are issued by the Fire Bureau.

There are approximately 7,000 underground storage tanks registered with the SWCB at 2,000 facilities in the City. Since the UST program began in 1987, the City has, on average, issued permits for the removal of approximately 300 underground storage tanks per year. There is estimated to be approximately an equal number (7,000) of USTs that do not fall under regulation. These are tanks under 5,000 gallons and are primarily household heating oil tanks.

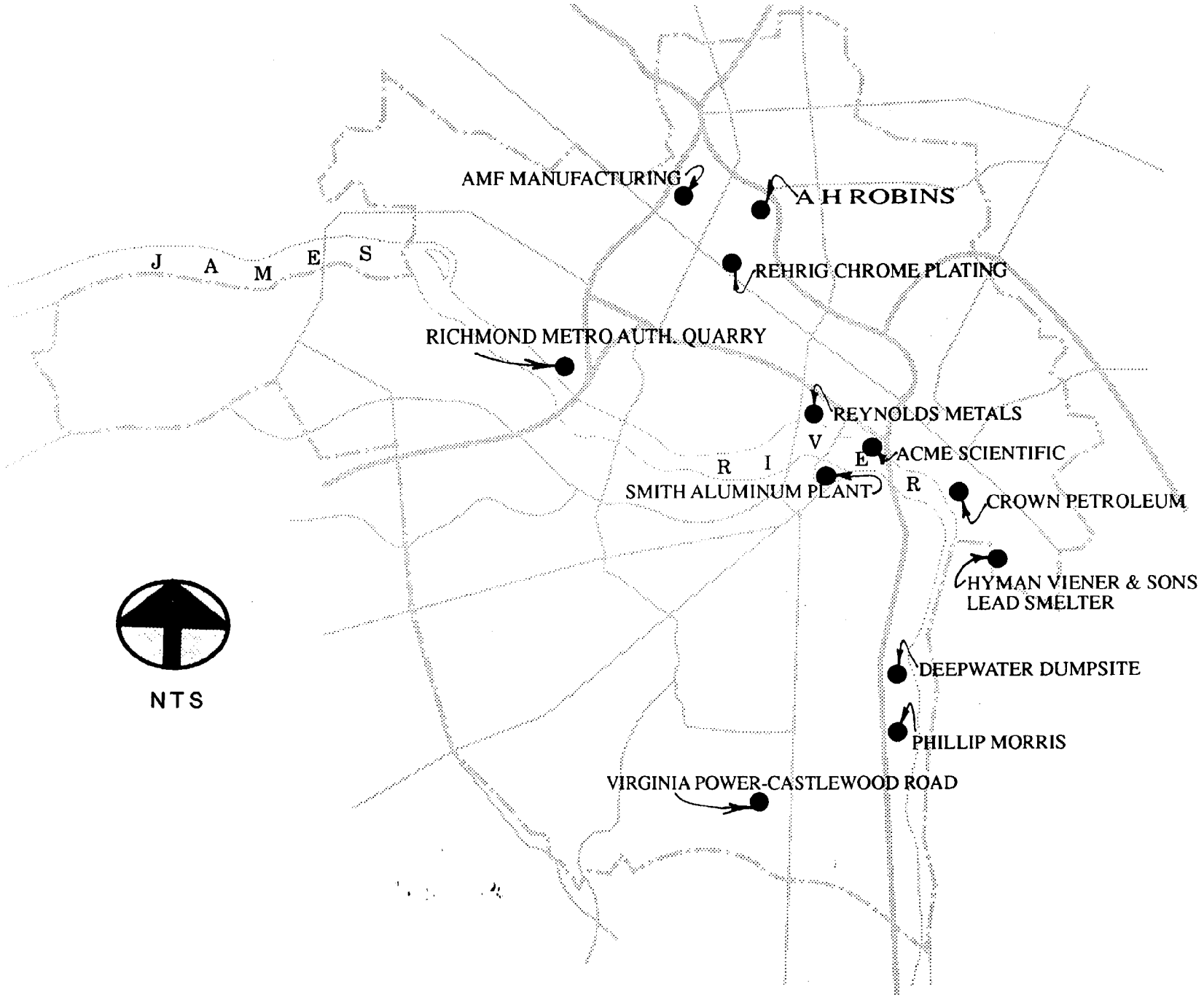
City owned USTs currently number approximately 100. Since the UST program began, roughly 30 City owned tanks have been removed. A program is in effect that involves testing all tanks annually and the replacement and/or removal of those that fail. Most of the known problem tanks in active use have thus been removed.

According to the State Water Control Board there are only approximately two dozen sites in the City which are known to be sufficiently contaminated to warrant monitoring or remediation (see figure).

Soil Contamination (CERCLA) Sites

Pollution of soil has occurred from various toxic or hazardous materials disposed of or spilled in older industrial areas of the City. No sites in Richmond are contaminated enough to be classified as Superfund sites under the CERCLA regulations at this time, although there are two in Chesterfield, one in Henrico, and one in Hanover.

The Virginia Department of Waste Management maintains a list of less severely contaminated sites, known as the CERCLIS list, which may potentially be designated Superfund sites in the future if worse contamination is discovered or if standards become more stringent. There currently are 12 sites in the City on the CERCLIS list (see figure). None of these sites are known to have contaminated groundwater sufficiently to have been referred to the State Water Control Board for monitoring or remediation.



RICHMOND SITES ON CERCLIS LIST-NOVEMBER 1990

FIGURE _____

Landfills

The protection of groundwater at solid waste facilities is the priority goal of the Virginia Solid Waste Management Regulations. The regulations require, among other things, monitoring of groundwater at permitted solid waste facilities and the provision of liners to protect groundwater from leachate for new facilities.

The Richmond Department of Public Works has responsibility for the management of the City's solid waste management facilities and their compliance with the State's solid waste management regulations. There are five City owned landfills in Richmond all of which are closed, although one facility accepts construction debris from City owned properties and projects (see figure). The site that accepts debris has a leachate collection system and the groundwater is sampled quarterly by the City at nearby monitoring wells. The four other landfills do not have groundwater monitoring programs in place.

Sewage Treatment Facilities

The Virginia Pollutant Discharge Elimination System (VPDES) program is administered by the State Water Control Board (SWCB) and requires a permit for discharges to state waters. Over the last three years, the SWCB has instituted in the VPDES program a requirement for the permitting of public and private waste treatment lagoons in an effort to limit groundwater contamination. The City's new VPDES permit for the wastewater treatment plant includes this groundwater monitoring requirement around its sludge handling operation area.

Non-point Source Pollution

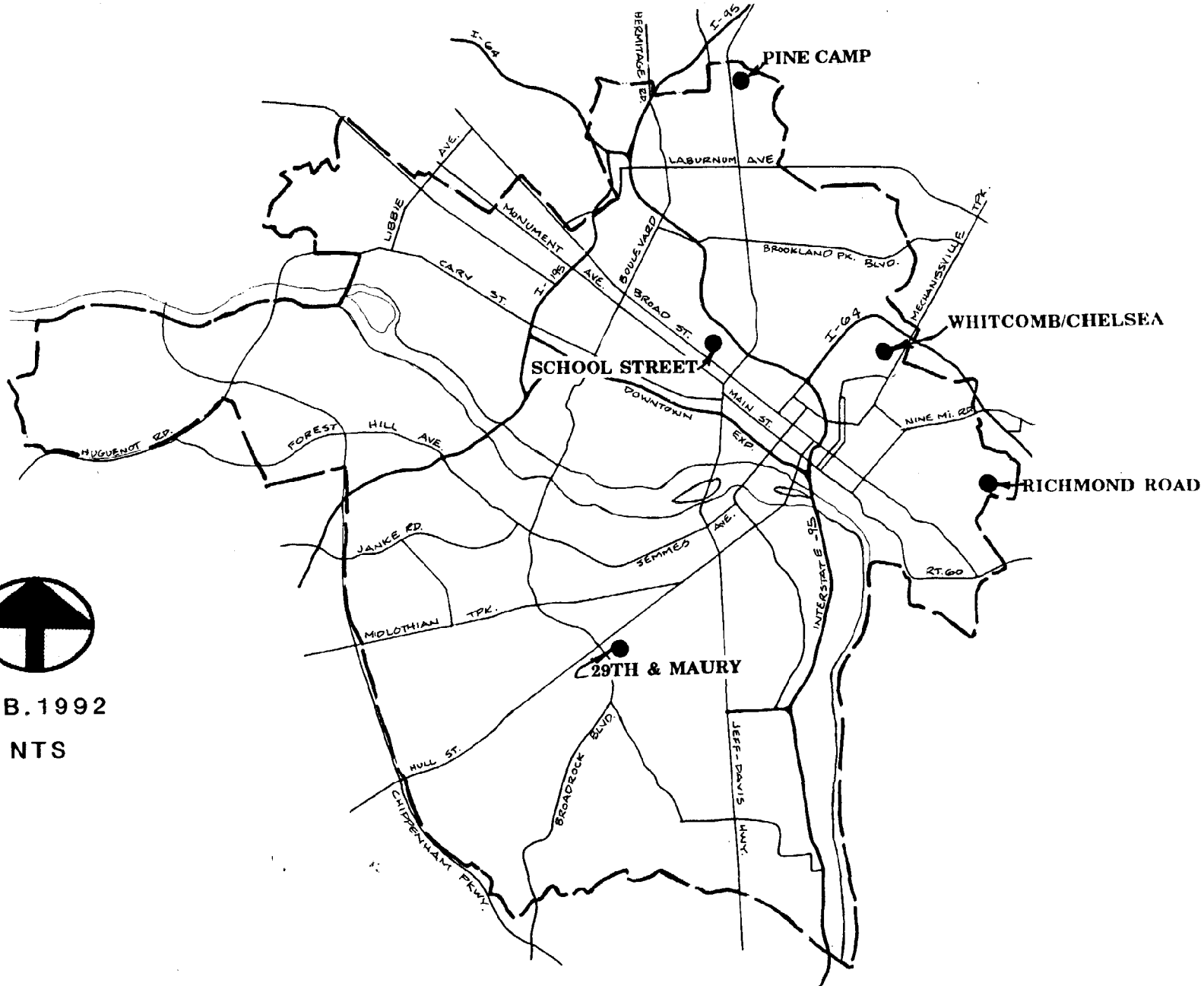
Non-point source (NPS) pollution is a possible source of groundwater contamination depending upon the geology of the area in question. The discussion of the hydrologic cycle at the beginning of this chapter describes possible contamination of groundwater from NPS pollution.

Recommendations

A. Continue with the removal and/or replacement of underground storage tanks in the City of Richmond consistent with the State underground storage tank program.

B. Monitor the status of potential Superfund sites, as listed on the CERCLIS list, through the Virginia Department of Waste Management.

- Pursue improvement of the quality of groundwater in areas where known contamination exists.



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NTS

LANDFILL SITES LOCATED IN RICHMOND

FIGURE _____

C. Develop a groundwater management plan that could be implemented through the City's land use regulatory authority.

1. Pursue development of a hydrogeologic map of the City which shows the locations and depths of aquifers, describes the geology of the aquifers, and contains information on the movement of groundwater and the location and sources of springs and artesian wells for use as a planning tool and source of information for groundwater remediation activities.

2. Inventory land uses and sites which have had or currently have the potential to contaminate groundwater.

3. Investigate the designation of groundwater recharge areas as necessary based on a study of the hydrogeologic map of the City.

4. Develop a site plan review procedure that includes facility design requirements aimed at groundwater protection.

IN-STREAM FLOW

OBJECTIVE
MANAGE WATER WITHDRAWALS TO REDUCE THE IMPACT ON NATURALLY OCCURRING FLOWS IN THE JAMES RIVER IN ORDER TO MINIMIZE ADVERSE EFFECTS ON DESIGNATED BENEFICIAL USES.

The James River provides many benefits to metropolitan Richmond including public water supplies for the City of Richmond and portions of Henrico, Chesterfield, Goochland, and Hanover Counties, process water for some industrial users, habitat for many species of fish and other aquatic life, and a wide variety of recreational uses. In the past, the James River within the City has also supported numerous hydroelectric power facilities. An adequate level of water flow is necessary for each of these uses which varies according to the use and the season of the year.

Historically there has been little problem with adequate in-stream flow except during occasional periods of drought. As demand for water in the region grows, it has become apparent that there may be future supply problems, specifically during times of below normal flow.

The State Water Commission has studied water flow requirements but currently has no comprehensive policy on in-stream flow sufficient to resolve many of the issues involved in the Richmond region. The Richmond Regional Planning District Commission (RRPDC) completed an evaluation of James River in-stream flow in May 1991 as part of its Richmond Regional Water Resources Plan. In addition Henrico County, which has proposed to construct a major water treatment plant upstream of the City, has recently completed a study of James River flow required by the U.S. Army Corps of Engineers as part of the intake structure permit application process.

The RRPDC report concluded that the James River should be sufficient to supply its portion of the region's water consumption needs through the year 2030 in times of average annual flows. The study also revealed that the flow level required for several beneficial uses (primarily recreation) would be violated numerous times each year; and that during drought conditions, the integrity of the City's water supply intake and the stability of the banks of the James River and Kanawha Canal may be threatened.

The City has been designated as the "administering agency" responsible for protection of the falls of the James River by State statute.

Recommendations

A. Continue stewardship of the James River within the City limits with particular interest in the falls area and canal systems.

B. Participate in a regional cooperative effort to develop measures that will reduce the impact of water withdrawals on the in-stream flows needed for designated beneficial uses such as domestic water supply, waste assimilation, cultural, aesthetics, fish and wildlife habitat, and recreation.

WATER CONSERVATION

OBJECTIVE

DEVELOP A WATER CONSERVATION PROGRAM FOR THE CITY OF RICHMOND IN CONJUNCTION WITH A REGIONAL COOPERATIVE EFFORT.

The Richmond region has long enjoyed a plentiful source of water in the James River; however, as water demand here increases the City may begin to see the type of supply problems which are being felt in many parts of the United States. Although the acute water shortages of the western U.S. are unlikely to be seen here, many eastern states are beginning to experience bitter battles over water rights.

Consumptive uses, such as public water systems and agriculture, have been pitted against each other and other beneficial uses, such as recreation or maintenance of aquatic ecosystems and threatened species. Without adequate water volume in streams and rivers, groundwater quality can also be threatened and the assimilative capacity of rivers to handle wastes can be reduced.

One approach being used to resolve such conflicts is regional or basin-wide cooperative pacts under which water resources can be managed to minimize shortages and equitably share water resources. Another tool is water conservation which prolongs use of the water resource in drought conditions, and can save the expense of water treatment and wastewater treatment facility construction and operation.

Richmond area water shortages are not projected to be acute, but problems are expected in low flow periods which may impact recreational use of the river and its natural ecosystem. Some threat to the City's water supply intake is even possible. Other localities further downstream may also be affected. Conservation measures for the City and other area jurisdictions are thus prudent in terms of wise resource management and cost savings to taxpayers.

The City participates in the RRPDC's Water Resources Task Force which has developed a recommended list of strategies for long term per capita water demand reduction. These strategies include pursuing State authority to enact stricter building code requirements for water saving fixtures, retrofitting programs, improvements in metering and meter replacement programs, leak detection and repair programs, water rate structures which encourage conservation, public education programs, water conserving landscaping practices, and water reuse. These strategies have not been adopted as part of an official plan for the Richmond region or for the City.

Recommendations

A. Increase public awareness of the importance of water conservation.

B. Develop and adopt a drought contingency plan which incorporates the following components:

   1. Priorities for water usage.

   2. Enforcement actions.

   3. Coordination with other appropriate jurisdictions.

C. Revise existing building code requirements to encourage the use of water conservation fixtures such as low-flush toilets, and flow restricted faucets and shower heads for new development and renovation projects.

D. Develop guidelines for use of xeriscaping and other water conserving landscaping techniques for public information and for use at City facilities and on City controlled land.

E. Employ water conservation efforts in City buildings and facilities including evaluation of the feasibility of incorporating a grey-water recycling program into City owned buildings and facilities.

F. Investigate the use of pricing mechanisms which encourage water conservation on a regional basis or as part of a regional pricing program.

G. Seek and support legislation for additional control authority.

DRINKING WATER

OBJECTIVE
CONTINUE TO MEET OR EXCEED THE REQUIREMENTS OF THE FEDERAL SAFE DRINKING WATER ACT AS WELL AS THE VIRGINIA STATE BOARD OF HEALTH DRINKING WATER REGULATIONS.

Richmond's Water Treatment Plant produces water which exceeds both State and Federal drinking water standards at the plant. Currently rated at 70 million gallons per day (MGD), construction is underway to increase the plant's rated capacity to 96 MGD. Also under construction is a floodwall which will protect the entire plant from James River flooding. Within three or four years, the City plans to have the plant certified for production of up to 132 MGD and ultimately 150 MGD.

While the water treatment plant itself has adequate capacity to serve the City's needs, there are two issues of potential concern. One relates to protection of the supply of water to the plant itself and the other relates to the quality of water at the tap for human consumption.

Drinking Water Supply Protection

Drinking water supply sources include groundwater and surface water. Water supply for the City of Richmond is drawn exclusively from the James River. The Richmond Water Treatment Plant is located in the western part of the City where its intake is upstream from the Sewage Treatment

Plant, combined sewer outfalls, and most of the larger volume storm sewer outfalls. Protection of that supply involves the identification and management of sensitive areas where supply can be polluted. The watersheds which contribute to water supply are sensitive areas in that improper development can contribute to water quality degradation.

To some extent, protection of water supplies is afforded by Federal and State laws and programs which promote and monitor water quality. In addition, the jurisdictions of Richmond, Chesterfield, Henrico, Hanover, Goochland, and Powhatan, all of which contribute to and depend upon the quality of water in the James River, are members of the Richmond Regional Planning District Commission and participate in the regional water resources task force. However land use, which has great potential to impact water quality, is regulated by local governments through their comprehensive plans, zoning, subdivision, and other land use ordinances.

The Chesapeake Bay Preservation program is a land use based program geared toward protecting the most sensitive lands within the City limits. In addition, approximately one third of the City is served by the combined sewer system which routes stormwater to the sewage treatment plant where it receives tertiary treatment, the City enforces a city-wide erosion and sediment control program, and conducts source control programs such as street cleaning and leaf collection.

This environmental element recommends the initiation of additional source control measures, consideration of expansion of the designated Chesapeake Bay Preservation Areas, designation of an environmental protection area which may extend beyond the Chesapeake Bay Preservation Areas (see page), and reevaluation of land use classifications within the environmental protection district.

Drinking Water Quality

Under the Safe Drinking Water Act (SWDA), the EPA set national standards for drinking water quality. In Virginia, the Department of Health regulates drinking water quality pursuant to the Virginia Public Water Supply Act, by issuing permits which require compliance with state and national standards. The Department of Health also has the primary responsibility for enforcing compliance with all drinking water standards and any other permit conditions.

The Virginia Department of Health has promulgated Waterworks Regulations to guide its regulatory functions under the Public Water Supply Act. These regulations include:

- Minimum health and aesthetic standards for pure water (water fit for human consumption and domestic use) and for water taken into waterworks.
- Criteria for the siting, design and construction of water supplies and waterworks.
- Requirements for inspections and testing of water.
- Requirements for issuing permits.

If a water system provides water for human consumption and has at least 15 service connections, or regularly serves an average of at least 25 individuals daily at least 60 days out of the year, it is deemed to be a "waterworks" and is subject to regulation. The term waterworks includes all structures, equipment, and appurtenances used in the storage, collection, purification, treatment and distribution of pure water, except the piping and fixtures inside the building where the water is delivered.

The Waterworks Regulations cover the same subjects as the federal regulations, but provide one notable addition: they require each waterworks to establish and enforce a program of cross-connection control and backflow prevention. Cross-connections are connections in the water system which could allow "backflow" to occur. Backflow is the flow of liquids into the water system from what should be a discharge point, causing potential contamination of the water system.

Pursuant to the SDWA, EPA has adopted the National Primary Drinking Water Standards that prescribe the maximum permissible levels of certain contaminants (maximum contaminant levels or "MCLs") in water delivered to end-users connected to any public water system. EPA has also adopted national secondary drinking water regulations which set maximum level for contaminants that affect the aesthetic qualities of drinking water. They are merely guidelines for the states and are not federally enforceable.

The National Primary Drinking Water Standards attempt to deal with the problem of lead in drinking water. These new standards are ten times as protective as previous regulations which had an allowable lead level of 50 parts per billion (ppb) measured anywhere in a water distribution system. The goal of the new standard is for at least 90% of monitored household drinking water taps to have a MCL of 15 ppb for lead, and 1.3 ppm (parts per million) for copper.

The standards require public water suppliers to monitor for lead at household taps. Monitoring is to be of the first-draw water, which contains the most lead, and is to take place in at-risk homes: those with new lead solder (applied since

1982) or with lead service lines. Cities with populations over 100,000 (this includes Richmond) will be required to monitor 100 high risk homes twice a year. Systems which exceed the 15 ppb MCL at any time after monitoring begins must inform customers every six months how to minimize drinking water lead exposure through an EPA-developed public education program.

The standards focus on the main cause of lead in drinking water: corrosion of lead from pipes, solder, and fixtures between the water treatment plant and the consumer's tap. The more corrosive the water leaving the treatment plant, the greater the chance that this water will leach lead from plumbing and carry it to the consumer. In some cases water suppliers can greatly reduce the amount of lead at the tap by minimizing the corrosivity of water at the treatment plant.

Corrosion control treatments include using substances such as lime and soda ash to reduce water acidity by increasing pH and alkalinity. Corrosion inhibitors may also be added to water to help form protective coatings inside pipes. If, after corrosion control treatment has been in effect for three years, tap water lead concentrations still exceed the MCL of 15 ppb, water suppliers are required to replace all lead pipe service lines over a 15 year time period. Replacement can be discontinued at any time the MCL is met.

Service lines connect household plumbing with the water mains of the supplier. Public water suppliers are not responsible for plumbing inside private homes at this time. If suppliers have exhausted all the lead control options mandated in the standards and lead concentrations still exceed the MCL the supplier must continue its public education program.

The City of Richmond is required by the Safe Drinking Water Act to meet the maximum contaminant levels (MCLs) for a number of constituents, including lead and copper. These levels may not be exceeded in more than 10% of the samples taken for the purpose of drinking water monitoring (90% of the sample must meet the standard). There is an on-going debate among legislators, municipal representatives and citizens concerning exactly where a municipality's responsibility for water quality ends. The City contends that its responsibility for water quality ends as the water passes through the water meter at the consumer's home.

The new regulations require that systems that serve over 100,000 people to begin testing of water at the tap. In addition, the City must develop and implement a program of corrosion control treatment, source water treatment, public education, and lead service line replacement. It is estimated that there are approximately 20,000 lead service lines in the City system.

The water system of the City of Richmond currently meets the maximum contaminant levels (MCLs) mandated by the Safe Drinking Water Act. It also has a cross-connection and backflow monitoring system as required by the Act. In addition, the City is currently drawing up a list of over 200 households from which to sample the drinking water.

Recommendations

A. Implement the sampling (at the tap), operational, and technical requirements of the new lead and copper provisions of the Safe Drinking Water Act in a timely manner.

B. Develop a monitoring system to check for other contaminants, toxics, and organics which can be used to evaluate the quality of the drinking water as standards are developed.

C. Complete a study which will determine the appropriateness of lead service line replacement. The study should incorporate the following elements:

   1. Identification of areas likely to have lead service lines;

   2. determination of the extent to which lead service lines contribute to the presence of lead in drinking water;

   3. identification of issues concerning replacement of lead plumbing in the remainder of the house;

   4. identification and evaluation of alternative remediation measures;

   5. analysis of lead service line replacement cost; and

   6. identification of alternative funding sources.

D. Develop a strategy to analyze the findings of the lead service line replacement study.

E. Develop a public education program to increase awareness of drinking water quality issues including measures residents can take for protection from lead and other contaminants which can enter the drinking water, and the availability of home testing by private labs in the City.

F. Pursue implementation of recommendations which contribute to the protection of drinking water supply: City-wide source control measures, expansion of the Chesapeake Bay Preservation Areas, designation of an environmental protection district, and reevaluation of land use classifications within the environmental protection district.

A REGIONAL APPROACH TO WATER ISSUES

OBJECTIVE
SUPPORT REGIONAL WATER RESOURCE MANAGEMENT.

Previous sections have discussed the effectiveness of a regional approach to the challenges of water supply planning, management, and conservation. Even if James River flow does not become a major problem in Richmond in the near future, it is becoming apparent that the wise use of water resources will increasingly be a matter of broader concern, affecting not only this region, but eventually the entire James River basin. The cost of water everywhere can be expected to rise driven by the effects of federal and state regulations.

There is widespread agreement that a regional approach can be more cost effective and more efficient in conserving water resources. Even though various obstacles may exist to full regional cooperation at any given point in time, the City should take a leadership role in working toward a true regional approach to water resources management.

The City participates on the Water Resources Task Force of the RRPDC and has taken an active role in developing the draft portions of a Regional Water Resources Plan. Richmond Mayor Walter Kenney sponsored the resolution by which the RRPDC officially adopted the Recommended Preferred Alternative 1-Modified portion of the Plan in June 1991. The vote was divided, particularly over the issue of timing of construction of the proposed Henrico County water treatment plant. Henrico is proceeding with its application to build the plant immediately, even though that would not be the most cost effective use of City or County funds. Considerable work must be done for the regional plan to become a meaningful policy document which is fully endorsed by all member governments.

Recommendations

A. Continue to participate in the RRPDC's Water Resources Task Force.

B. Work through the RRPDC to develop a cooperative regional approach to water quality and supply issues such as conservation, usage, and in-stream flows.

C. Support the formation of a regional water resource management agency for the purpose of developing a regional approach to water supply planning and management.

NATURAL FEATURES

Chapter 4

INTRODUCTION

The urban landscape of Richmond has evolved over 200 years of adapting, molding, manipulating, and accommodating the natural environment. Unique opportunities exist within the City for experiencing pristine natural beauty within a context of amenities and opportunities offered only by a structured, man-made urban system. The extent to which the natural environment plays a role in this system can be attributed to both vision on the part of individuals as well as both coincidence and chance. Because of visionary planners, City leaders, and philanthropists abundant mature street trees enhance neighborhoods, and extensive public parks and unspoiled natural corridors welcome citizens and visitors alike. The health and attractiveness of the urban environment is dependant upon how well natural amenities are preserved and incorporated into future development. A healthy urban environment contributes to the value of property and the desirability of the City as a destination for visitors, and as a place of residence and business.

The responsibility for ensuring the continuance of the City's urban environment rests with the citizens of Richmond, the City administration, and the City Council. The residents of the City have the responsibility of making their concerns and needs, both long and short term, known to their elected officials and the City administration. The City administration must serve as a conduit between the citizens and City Council for the development and implementation of those plans and programs. The City Council must have the vision necessary to adopt long range plans and strategies to fulfill these needs. In addition, City Council must be prepared to allocate resources to facilitate the implementation of these plans.

The ability of the City to control the physical environment originates from its land use authority granted under the City Charter. City Council is empowered to adopt a comprehensive plan, zoning ordinance, and related land use regulations. Additional tools have been granted to the City by the General Assembly to protect sensitive lands and structure the urban environment. Further opportunities have been identified in this chapter which meet current environmental and development objectives yet may require additional legal authority as granted by the General Assembly.

This chapter provides an information base and a policy framework for decision-making on the part of City officials. The chapter also describes plans, programs, and strategies recommended to facilitate the City's ability to protect and enhance present and future resources.

GOAL

PRESERVE AND ENHANCE RICHMOND'S NATURAL FEATURES AND RECREATIONAL AMENITIES FOR THE ENJOYMENT OF ALL CITIZENS.

URBAN LANDSCAPE

OBJECTIVE

PROMOTE THE PRESERVATION AND MAINTENANCE OF EXISTING VEGETATION AND GUIDE THE PLANTING OF NEW VEGETATION FOR THE PURPOSE OF IMPROVING THE QUALITY OF DEVELOPMENT, IMPROVING THE AESTHETICS OF THE CITY, PROVIDING HABITAT FOR URBAN WILDLIFE, AND MINIMIZING STORMWATER RUNOFF.

The role of natural vegetation in the urban environment extends beyond simple aesthetics. Mature trees whether lining public streets, grouped in small forests and parks, or incorporated into private development provide a variety of benefits for the environment and assist the economic health of the City. They provide shade and help regulate temperature, help control stormwater runoff and erosion, provide shelter and habitat for wildlife, and filter pollutants and carbon dioxide from the air while emitting life-giving oxygen. The existence of mature trees on residential lots and lining residential streets also contribute to enhanced property values, leading to improved tax revenues.

Under the City Charter, the City is empowered to plant and care for trees in City parks and public rights of way. The preservation and maintenance of the City's trees is the responsibility of the Department of Recreation and Parks Tree Division. Unfortunately, the Division is financially limited in what it can accomplish as far as preservation and maintenance programs are concerned. Over the years budget cuts have forced the Division to compromise its seasonal maintenance program. Today it administers a program which is much more crisis oriented and complaint based than is desirable. The City currently is losing street trees to age, disease and damage at a faster rate than they can be replaced. The City currently has no tree ordinance or comprehensive management/preservation program; however, the City Arborist has developed an ordinance and is preparing to submit it to City Council.

Preservation and proper maintenance of trees and natural vegetation on private property are equally critical to our natural environment. This is true both for remaining undeveloped land as well as developed properties. The City

has authority to require preservation or replacement of trees and other vegetation in certain cases in Chesapeake Bay Preservation Areas.

A recommendation of the environmental element is to develop a landscape ordinance to require the preservation of vegetation, replacement of vegetation removed during the construction process, and planting of vegetation on sites where it previously may not have existed. Very clear legal authority exists regarding the development of a tree conservation ordinance, and an ordinance which provides for the planting and replacement of trees during the development process; however, at this time there appears to be no authority for the more general goals envisioned for a landscape ordinance.

Recommendations

A. Develop and implement a municipal landscape management program which addresses the following issues:

1. Preservation and maintenance of existing vegetation on City-owned property.

2. Management of the removal and replacement of hazardous dead or dying trees on City-owned property.

3. Planting and replacement of trees on City-owned property.

4. Planting of new vegetation on City-owned property, including guidelines for planting, maintenance, species (encourage the use of native species in planting projects), location, diversity, and safety.

5. Establishment of programs in which citizens or organizations can participate in the maintenance of landscape features on City-owned property such as adopt-a-tree, adopt-a-spot, adopt-a-park, adopt-a-garden.

6. Unauthorized removal of vegetation on City-owned property.

7. Guidelines for tree trimming with utilities, such as Virginia Power, C&P, etc. on City-owned property.

8. Priorities and funding for accomplishment of the above.

B. Develop and adopt a Landscape Ordinance, for the regulation of private development projects, to include the following:

1. Requirements for the submission of landscape plans during existing land development review processes.

2. Requirements for the preservation and maintenance of existing vegetation.

3. Requirements for transitional buffering and landscaping between land uses, including park spaces.

4. Requirements for the landscaping of parking lots.

5. Design standards for the preservation of existing vegetation, planting, and maintenance of landscaping.

6. Tree canopy requirements.

C. Seek and support legislation for additional control authority to apply landscape ordinance requirements to development within the City of Richmond, specifically to require the placement of new vegetation where it does not already exist.

D. Develop a public education program, administered by the Department of Recreation and Parks, to assist homeowners with the preservation of existing vegetation; the selection, planting, and maintenance of new vegetation; and the selective clearing of sight lines, particularly in environmentally sensitive areas and areas designated for protection.

1. Include courses on plant selection, planting, and maintenance in the adult education curriculum in City schools.

2. Institute programs within the Department of Recreation and Parks which focus on gardening and horticulture as a way to increase awareness of the importance of vegetation and ground cover.

URBAN WILDLIFE HABITAT

OBJECTIVE
PRESERVE, MANAGE, AND PROMOTE URBAN WILDLIFE AND WILDLIFE HABITAT IN A MANNER CONSISTENT WITH THE RESOURCES AND NEEDS OF THE CITY.

Urban wildlife and natural habitat provide many benefits to the city dweller. A subtle, but unmistakable, sense of psychological well-being and harmony with nature come

from sharing the environment with wildlife, especially when it can be viewed in a natural environment. Areas of natural habitat can be used for educational purposes and allow city residents to participate in enriching and fulfilling activities. A natural environment allows for a host of recreational activities including fishing, bird watching, and creative arts such as photography and painting.

The City of Richmond is home to a surprisingly wide variety of wildlife and habitat. In addition to the species of birds and mammals usually associated with an urban environment, such as pigeons and mice, the City has populations of raccoons, rabbits, deer and other mammals; frogs, toads, lizards and other amphibians and reptiles; and hosts of insect species. All of these forms of animal life require habitat in which to carry on their life processes. Habitat provides food sources, cover from predators, shelter from the weather, suitable places for reproduction, and protection from disturbance.

As habitat shrinks in size and becomes disconnected due to development of natural open space, wildlife becomes more concentrated and competition for available space increases. This leads to a number of problems including:

- Additional physical and psychological stress as competition for space and food increases; and

- increased contact with humans and their pets, which may or may not be harmful, but which can lead to disease transmission, nuisances, and animals being struck by cars.

Another problem associated with the disconnected nature of urban wildlife habitat is the greater degree of mobility required for wildlife as it forages for food and shelter. As the resources of one habitat area are used up the wildlife must travel to other areas.

The cost of providing this habitat for wildlife can be quite small. Provision for greenways and planning for wildlife populations "up front" are two ways in which habitat can be saved or augmented. By simply leaving open fields and green spaces as meadows, or cutting them only once or twice a year, the City or other property owners can provide habitat for ground-dwelling mammals and birds. Tree preservation and maintenance programs can also be utilized to provide additional habitat for birds and mammals by preserving nesting areas in standing trees and through the use of felled trees to form nesting sites.

The City currently maintains the James River Park and other natural areas for the enjoyment of the public. These areas provide habitat for many of the wildlife species found in the

City. Park regulations and City ordinances exist which prohibit the destruction of park property and require that dogs be leashed so as minimize disturbance to wildlife. The City is also participating in the development of greenways in and around the City which will provide paths between habitat areas for wildlife.

Another way for the City to maintain wildlife habitat is to incorporate into the development review process guidelines for preserving open space and consideration of open space configuration, plant species and other factors. Sensitive site design can accomplish wildlife protection without sacrificing other objectives. Steps for accomplishing this include the following:

- Identify wildlife species on site;
- identify existing habitat on the site;
- identify existing plant species and their habitat or food value on site;
- consider adjacent land uses and possible impacts of development on wildlife and habitat;
- plan the open spaces on the site so as to make it more attractive to wildlife;
- integrate wildlife considerations into negotiations with developers; and
- review the architectural design elements of the development to identify possible conflicts between human and wildlife use.

The City of Richmond's zoning ordinance has different open space requirements for different land uses. Residential developments must have a percentage of the lot designated as "livable space," meaning unpaved open space. Office, commercial, and industrial uses have no livable space requirement, although many projects of a complex nature require site plan review or approval of a plan of development. These review processes offer opportunity for negotiation regarding site design; however, there are not currently any specific requirements or guidelines which protect wildlife.

All of the above measures can best be undertaken if the City has an inventory of wildlife and habitat, and a management plan for habitat protection and enhancement. Such a plan can serve as a guide for the City in maintaining and developing its own properties, for citizens in maintaining their properties, and for developers and City officials administering development regulations.

Recommendations

A. Develop a Habitat Management Plan for the City of Richmond which provides for the preservation and maintenance of habitat, and maximizes the opportunities for the public to interact with native wildlife populations as appropriate. The plan should include the following:

1. Identification of habitat areas to be preserved and left untouched.

2. Identification of habitat areas suitable for public access.

3. A plan for the maintenance and management of those areas suitable for public access.

4. Identification of areas suitable for the development of wildlife habitat.

5. Mechanisms for participation by public and private groups in the development of additional wildlife habitat.

6. Guidelines for habitat preservation to be incorporated into development regulations and processes.

B. Provide educational opportunities regarding wildlife habitat with the assistance of public and private groups.

1. Develop signage programs for City parks which educate users about urban wildlife habitat preservation activities.

2. Sponsor or promote activities which expose the public to the opportunities for managed interaction with wildlife which exist in the City.

3. Develop programs designed to educate citizens on the provision of wildlife habitat areas in their own backyards.

4. Incorporate species identification and protection techniques into an urban wildlife education program for the public schools.

URBAN FISHERIES MANAGEMENT

OBJECTIVE

PROMOTE THE DEVELOPMENT AND MANAGEMENT OF THE JAMES RIVER AND APPROPRIATE LAKES AND STREAMS WITHIN THE CITY AS URBAN FISHERIES.

The City of Richmond is home to a great many urban fishery resources, the James River being by far the largest. The James River rapids are widely regarded as having the best smallmouth bass fishing in the United States and the areas of flat water above and below the downtown area are known for having exceptional largemouth bass fishing. The BassMasters Tournament, a nationally recognized largemouth bass fishing tournament, was held in the City for three years. Fishing has become so popular in the City that signs of over-fishing are beginning to be seen in some species. This has resulted in size limits being imposed on the over-fished species.

Some of the most heavily fished areas of the City include:

- The 14th Street Bridge, which is the most popular "fishing hole" in the City;
- Ancarrow's Landing (the Richmond Boat Ramp), which has excellent bank fishing;
- the dock of the Intermediate Terminal, which also has good bank fishing;
- the Huguenot Woods section of James River Park, which has facilities for putting in canoes and john boats; and
- the Pony Pasture section of James River Park, which also is a good place to put in a canoe.

All of these spots are at least partially accessible to handicapped individuals. Improvements have been made to Ancarrow's Landing, making it more appealing as a family fishing spot.

Anadromous fish, fish that spawn in fresh water and then return to either the Chesapeake Bay or Atlantic Ocean, such as shad, herring, and striped bass, may be blocked in their upstream migration by the dams of the James River.

Breaching these dams or building fish ladders might assist these species to continue their migration. These fish are caught not only for recreation but also have commercial value. Sustainable natural populations of these species would add to Richmond's reputation as having significant fish resources.

The City is working closely with the Department of Game and Inland Fisheries to provide fish passages through the dams along the James River. The Manchester and Brown's Island dams have been breached; however, fish gates for the Brown's Island dam remain to be purchased. The William's Island dam is the next dam scheduled to be breached which will allow fish passage all the way through the City to Boshers Dam at the western boundary.

With the increased interest in fishing comes an increase in the awareness of outdoor recreation activities in general. More attention is focused on the James River and its immediate environs. For this reason fishing can also serve an important educational role for inner-city children and adults. The Department of Recreation and Parks and the Richmond Newspapers Company have sponsored a number of organized fishing excursions for City youth. These have been very successful in bringing the issues of fishery management and resource protection to the attention of more people.

Recommendations

A. Develop a Fisheries Management Plan for the City of Richmond which provides for the development and management of urban fisheries, and maximizes fishing opportunities for the public.

   1. Identify and provide access to existing and potential fisheries with the assistance of public and private groups.

   2. Increase handicapped access to fisheries, particularly in areas impacted by the floodwall.

   3. Provide for the maintenance and policing of urban fishery access points.

B. Provide educational opportunities regarding fisheries preservation and management with the assistance of public and private groups.

   1. Develop signage programs for fishery access points which educate users about fishery management and preservation activities.

   2. Sponsor or promote activities which expose the public to fishing opportunities.

3. Incorporate species identification and protection techniques into an urban fisheries education program for the public schools.

C. Continue with implementation of plans to breach Williams Island Dam and support efforts to fund a fish passage at Boshers Dam.

ENVIRONMENTALLY SENSITIVE AREAS

OBJECTIVE

IDENTIFY, PROTECT, AND ENHANCE ENVIRONMENTALLY SENSITIVE AREAS WITHIN THE CITY CONSISTENT WITH THEIR ROLE IN THE URBAN ECO-SYSTEM AND CONTRIBUTION TO WATER QUALITY

Environmentally sensitive areas are sites which can be damaged by the impacts of land use and development. The goal of environmentally sensitive area protection is two-fold: to protect water quality; and to protect special features of the terrain such as wetlands, floodplains, and wildlife habitat which have other important environmental or cultural values. Richmond is home to a number of environmentally sensitive areas and features including wetlands, subaqueous bottomlands, floodplains, and diverse geologic features such as steep slopes and soils of high erodibility.

The management of environmentally sensitive areas is controlled by a variety of regulatory schemes as described in the Appendix. These include regulations which deal with water quality, land development and sediment control, and habitat protection laws.

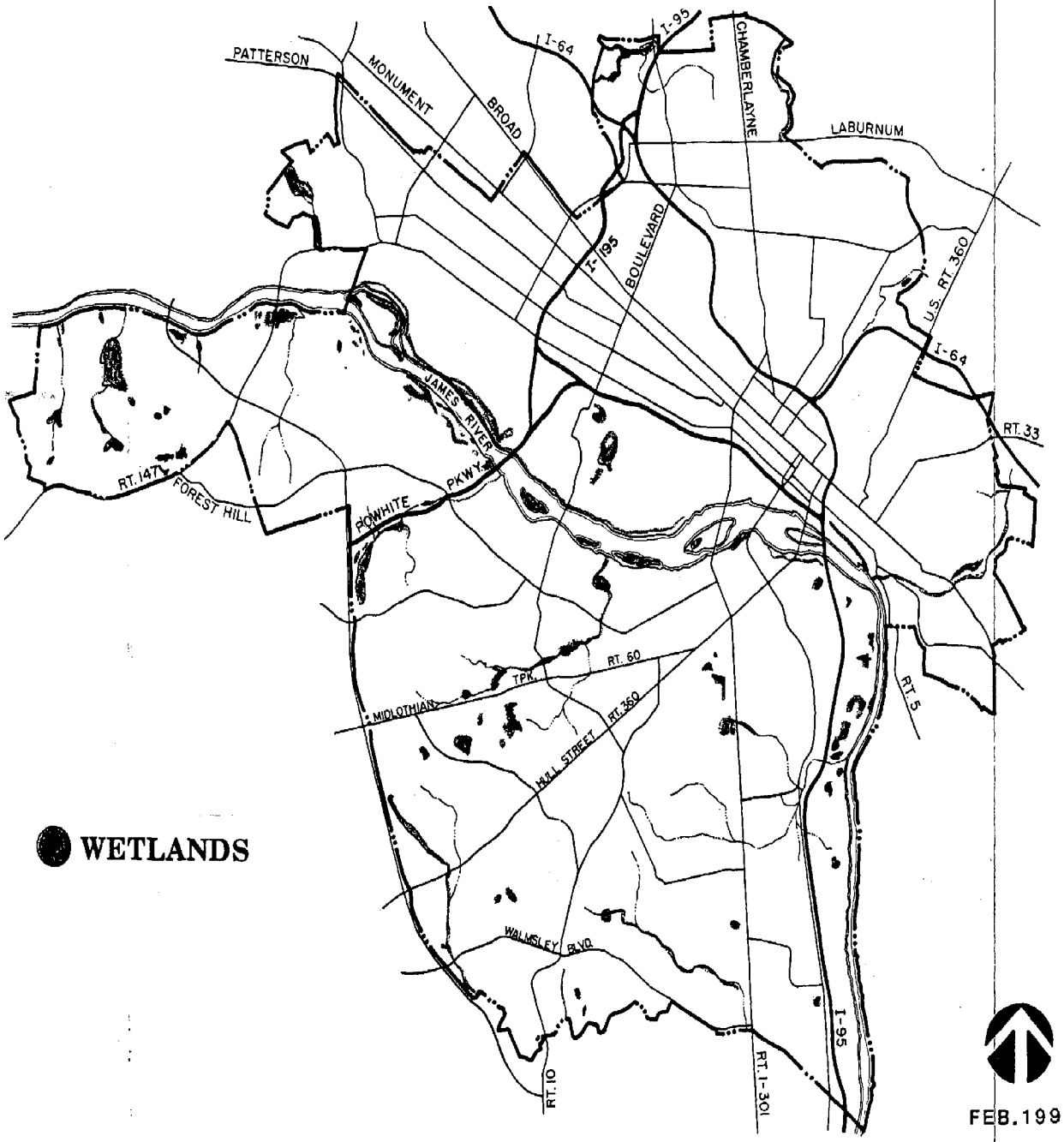
Wetlands

There are two types of wetlands:

- Tidal wetlands-formed by the tidal flow of bodies of water; and
- non-tidal wetlands, usually located adjacent to tidal wetlands, rivers and streams, or occasionally in isolated flat or low-lying areas.

Wetlands are important for a number of reasons:

- Flood conveyance and storage;
- sediment and pollution control;
- habitat and food source for wildlife;



WETLANDS

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- recreation and open space;
- water supply; and
- educational opportunities.

Section 404 of the Clean Water Act established the jurisdiction of the U.S. Army Corps of Engineers (ACOE) over wetland development. Before wetlands can be filled of disturbed, a permit must be obtained from the ACOE. The permitting process involves a determination by the ACOE, Virginia Marine Resources Commission (VMRC), and the local wetlands advisory board (if one exists) that the wetlands disturbance is necessary and unavoidable. City programs, such as the Chesapeake Bay Preservation Program and the erosion and sediment control regulations, also prohibit or apply performance standards to development in wetlands which are located Chesapeake Bay Preservation Areas (see figure)

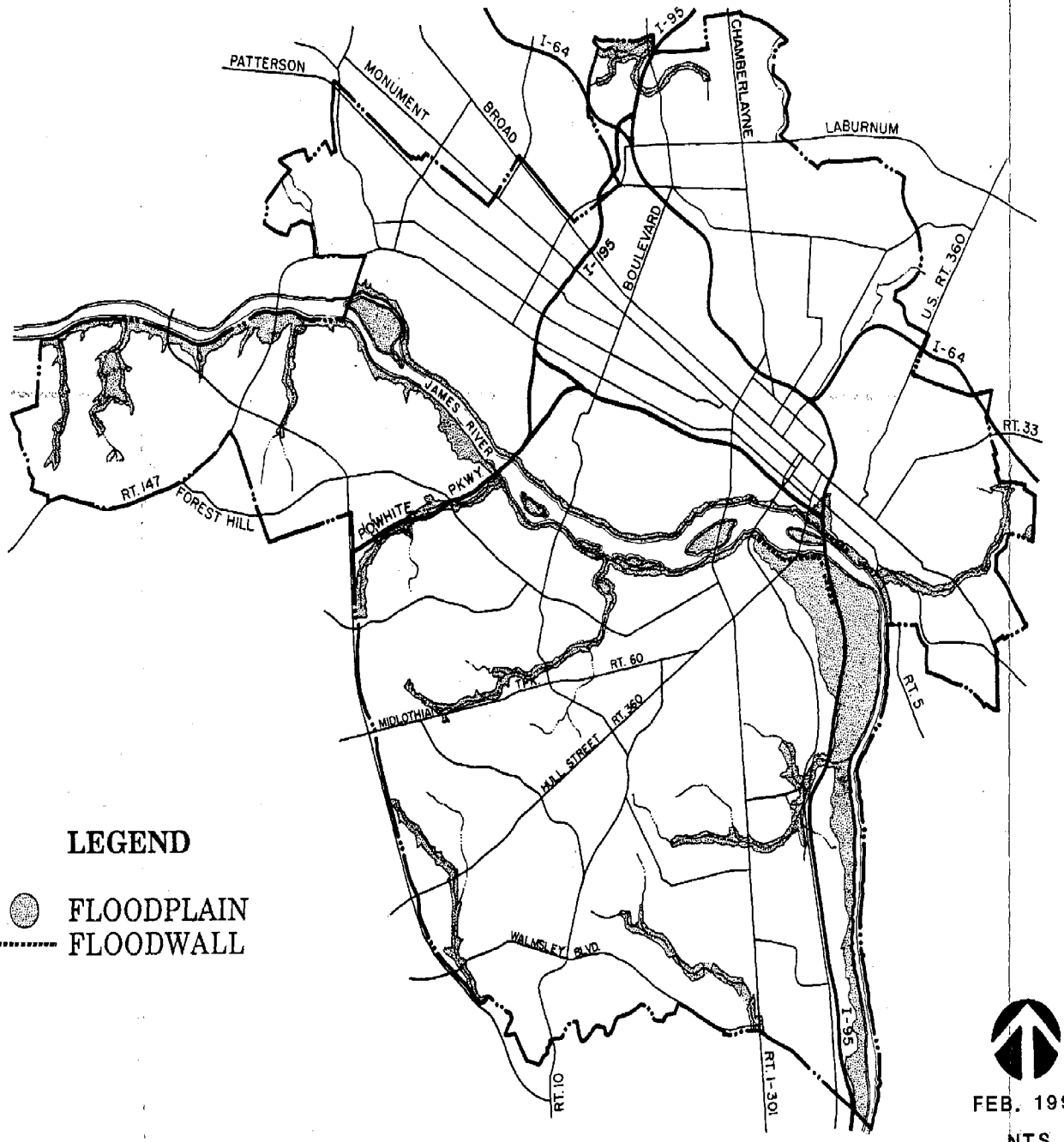
Subaqueous Bottom Lands

Subaqueous bottomlands, including river beds, stream beds, and channels are all considered the property of the Commonwealth of Virginia. As such, they are subject to regulation. The VMRC is empowered to issue permits which allow the encroachment upon state bottomlands provided the proposed encroachment meets required standards. These permits do not interfere with the riparian owners' rights and privileges, which extend to the "mean low-water mark." There are five exemptions from permitting:

- Erection of authorized dams;
- the lawful and permitted taking of shellfish;
- federal navigation and flood-control measures;
- piers, docks, terminals, and facilities owned by the State and leased to localities; and
- noncommercial private piers.

Floodplains

Floodplains are low-lying areas adjacent to rivers and streams which are subject to periodic flooding when upstream or local precipitation causes the volume of water to exceed the normal capacity of the waterway. In their natural conditions vegetated floodplains serve important functions by filtering runoff before it enters the waterway, temporarily storing floodwaters and slowing their velocity, and providing habitat for wildlife.



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FLOODPLAIN

FLOODWALL

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Development in floodplains interferes with most of these natural functions and is at risk of damage in times of flood. Generally, development should be discouraged where possible, and designed to avoid flood damage where encroachment in the floodplain is necessary and permissible under applicable regulations.

In Virginia, regulation of development in floodplains is vested primarily in localities, acting through local land use controls and within constraints imposed by Federal floodplain insurance requirements. The City's Floodplain Management Ordinance establishes standards for development which is permitted to take place in the floodway and floodway fringe. Development in the floodplain is also regulated by the City's Chesapeake Bay Preservation program, under which the Resource Management Area includes the limits of the 100 year floodplain.

The City and the ACOE are currently working together to build a $___ million floodwall which will protect a substantial portion of southside, downtown, and Shockoe Bottom from flood damage (see figure). Upon completion of the floodwall, scheduled for 1993, the City will request a reevaluation of the floodplain designation which will make redevelopment of many sites feasible.

Steep Slopes and Other Geologic Features

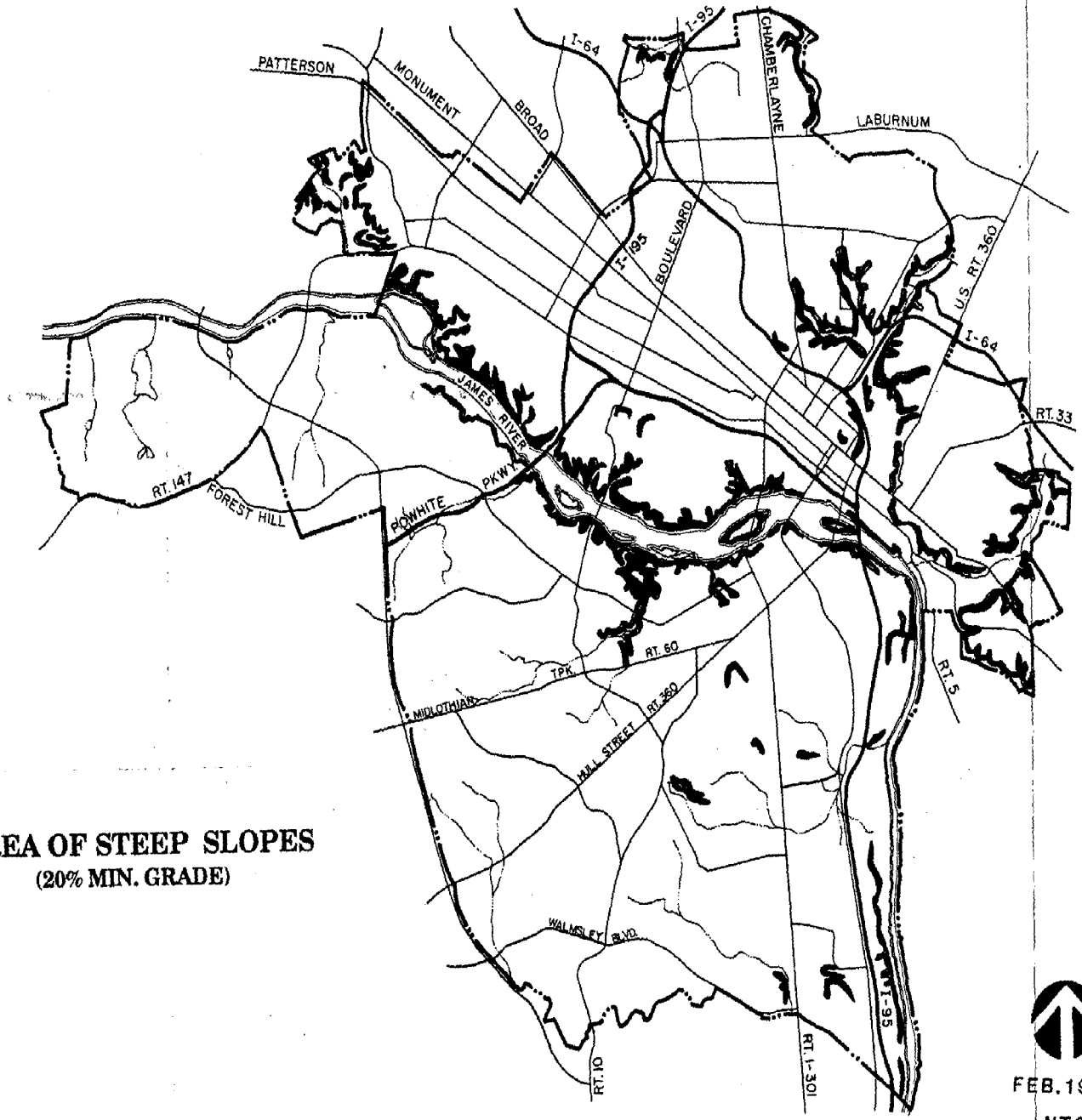
Steep slopes offer variety and visual appeal in many parts of Richmond's landscape. Often they exist as pockets of undeveloped open space and thus provide many benefits in the form of wildlife habitat, wilderness or attractive natural spaces and buffers within the community. Usually found along the James River and tributary streams, improper development of steep slopes could adversely impact water quality if improperly developed (see figure). Steep slopes are most vulnerable when exposed during construction. Over half of the steep slopes within the City of Richmond are designated as Chesapeake Bay Preservation Areas and must comply with the recently adopted program. In addition, property owners must comply with the erosion and sediment control regulations for land disturbance of greater than 4,000 square feet City-wide and in areas where additional control measures are deemed necessary.

Recommendations

A. Identify environmentally sensitive areas, such as wetlands, which are appropriate for protection.

B. Incorporate provisions for the protection of designated environmentally sensitive areas into City ordinances and review processes.

   1. Require the delineation of environmentally sensitive areas on development plans.



AREA OF STEEP SLOPES
(20% MIN. GRADE)

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FIGURE

2. Encourage the exploration of alternatives to development within the environmentally sensitive areas.

3. Require the mitigation of development impacts on environmentally sensitive areas.

   - Identify potential areas for mitigation of development impacts.

C. As major changes warrant, evaluate floodplain and floodway designation and pursue amendment as appropriate.

D. Modify the Floodplain Management Ordinance to incorporate recognition of the various functions of the floodplain such as water quality improvement, flood attenuation and velocity reductions, and provision of habitat.

   - Identify portions of the floodplain which serve to protect the water quality of the James River and develop standards for land development within those areas.

E. Integrate the protection of environmentally sensitive areas with the stormwater control strategy/program for appropriate utilization of these areas.

URBAN OPEN SPACE

OBJECTIVE
ENSURE AVAILABILITY AND ACCESS TO OPEN SPACE, RECREATION, AND NATURAL AREAS FOR ALL CITIZENS OF RICHMOND THROUGH IMPLEMENTATION OF A MASTER PLAN FOR PARKS AND NATURAL AREAS.

The City of Richmond offers a great variety of open space and natural areas for the enjoyment of all citizens of the metropolitan area. Open spaces include public and private school grounds, golf courses, cemeteries, and the more traditional landscaped parks and recreation centers. Of equal importance are the small, neighborhood-oriented open spaces such as "vest pocket" parks (sites usually less than two acres featuring playgrounds and small picnic areas). Natural areas include tracts of land undisturbed by development, such as the James River Park, areas adjacent to development which remain "wild", such as the landscaped banks along the Downtown Expressway.

Open space and natural areas provide two primary functions: recreation and conservation. Recreation areas include both active facilities, such as ballfields and playgrounds, as well as passive parks and less developed open areas for activities such as hiking, picnicking, and fishing. Conservation areas are lands that serve the general purposes of protecting vital resources and preserving an ecological balance. These include areas devoted to wildlife conservation, areas of unique geological or botanical interest, areas which provide protection of air and water resources, and areas of historic and scenic interest.

The benefits attributed to access to open space and natural areas include psychological benefits gained from visual relief from the urban environment and the opportunity for physical relaxation; conservation benefits gained from the preservation of wildlife and habitat; and economic benefits gained by the increased value of nearby property and increased appeal to potential residents, businesses, and tourists alike.

The City of Richmond has an extensive system of park and recreation facilities which are maintained and operated by the Department of Recreation and Parks (see figure). These include a diverse offering of active playgrounds and natural wilderness areas. The City Master Plan examines the publicly owned park and recreation facilities in some detail, including an assessment of their adequacy to serve the population of the community, based upon national and state guidelines.

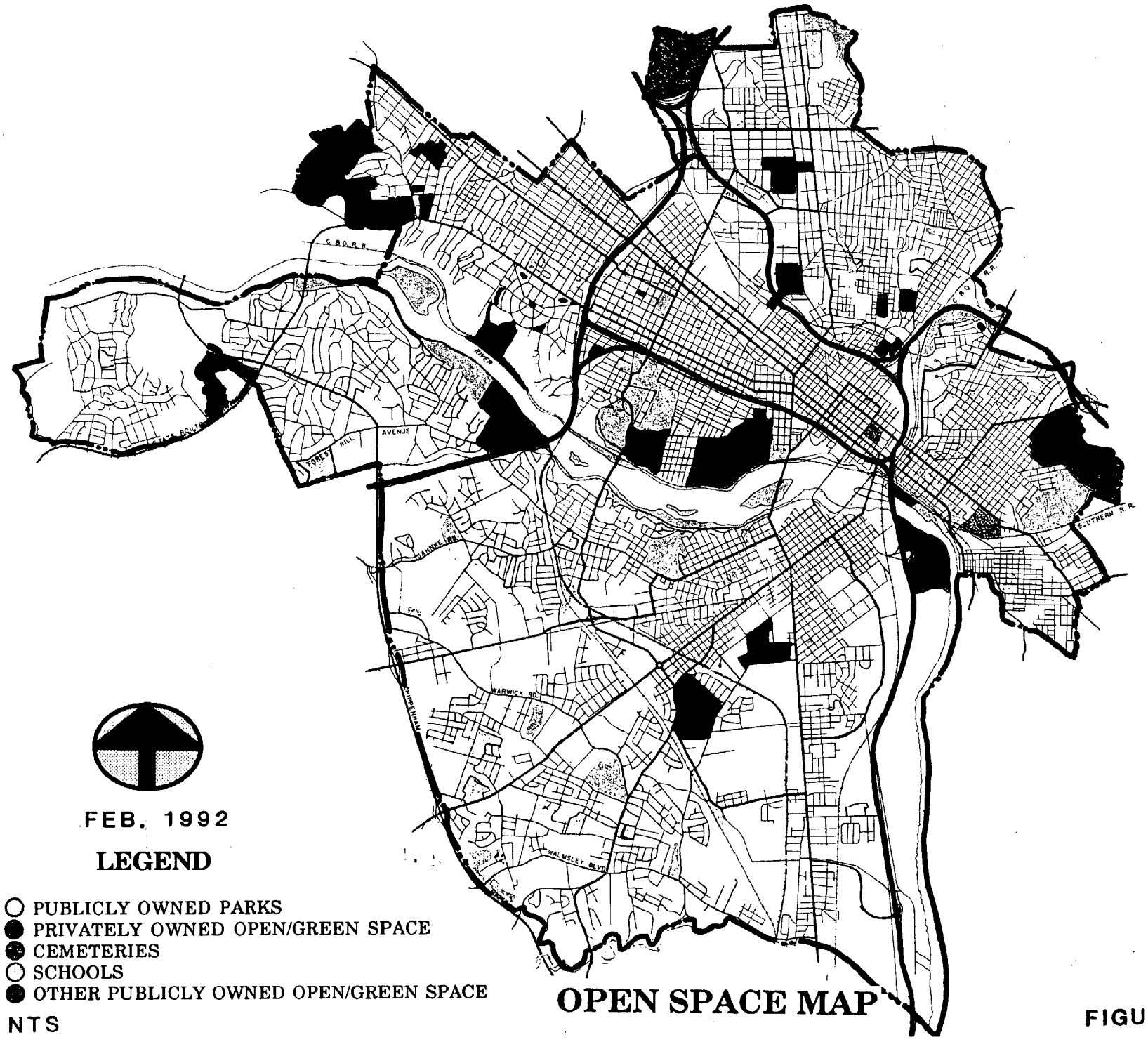
The adequacy of recreation areas is evaluated according to two criteria:

- The acreage of space devoted to recreation, based on standards in use by the Virginia Outdoor Recreation Commission; and

- The number of recreation facilities and the amount of equipment available for use, based upon standards used by the National Recreation and Park Association.

As summarized in the Master Plan the 655 acres devoted to recreation exceeded the recommended 552 acres based upon 2.5 acres per 1,000 people in 1983. The Plan evaluates the distribution of facilities in relation to neighborhood population, but does not distinguish between active and passive recreation, between dense urban situations versus more suburban areas, or among different socio-economic groups which may have different needs.

According to the Master Plan there were 1,383 acres in eight major parks (defined as over 30 acres) which exceeded the recommendation of 1,180 acres (at 5 acres/1,000 people) by



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LEGEND

- PUBLICLY OWNED PARKS
- PRIVATELY OWNED OPEN/GREEN SPACE
- CEMETERIES
- SCHOOLS
- OTHER PUBLICLY OWNED OPEN/GREEN SPACE

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OPEN SPACE MAP

FIGURE _____

the National Recreation and Park Association standards. Twenty seven minor parks included 97 acres which fell far short of the 548 acres recommended by the NRPA standards. Since 1983 additional park land has been added to the City system, including 390 acres proposed for Pocosham, Powhite, and Stony Point parks.

Master Plan for Parks and Natural Areas

Today, nearly ten years after the current City Master Plan was approved, there is a need for a comprehensive reevaluation of the City's existing open space and natural areas and needs in light of a variety of factors, including:

- Changes in the City's population;
- budget and personnel cuts and other changes affecting maintenance or operations;
- new trends in the recreation and parks field;
- emerging environmental issues; and
- concern that important privately owned natural areas may be lost to development.

The environmental element recommends the development of a master plan for urban parks and natural areas for the purpose of protecting the parks, recreation, and open space resources which exist today as well as guiding the City in adjusting City-owned resources to meet future needs. The plan would involve the integration of open spaces and natural areas with recreation programs and services. In addition, the plan would work in concert with the City Master Plan to implement the greenways plan currently being developed by the Metro Richmond Greenways Advisory Committee. As explained in the following section, a greenways network would enhance park and recreation facilities by linking them to the City's open spaces and other attractions through a system of pathways, thus increasing access to those facilities by all residents of the metropolitan area.

Recommendations

A. Develop a master plan for parks and natural areas within the City which addresses physical and maintenance needs, identifies opportunities for the expansion of the City recreation and parks system, and ensures availability and access to open space, recreation and natural areas for all citizens of Richmond.

   1. Identify areas appropriate for the expansion of the system consistent with the greenways plan.

2. Identify opportunities for expansion of the system, i.e. vacant or under-utilized land either publicly or privately owned.

3. Implement capital improvements and allocate maintenance resources consistent with the park master plan.

B. Designate the Department of Recreation and Parks as the agency responsible for development and maintenance of all plans for City-owned parks and natural areas.

C. Provide opportunities for public input in all park planning efforts.

D. Review the recreation and open space standards currently used in the City Master Plan to determine their applicability given the varying densities, development patterns and human needs in each of the City's nine planning districts.

1. Identify standards appropriate for each planning district.

2. Identify potential recreation and open space opportunities within those areas to account for deficiencies.

E. In the denser residential areas of the City ensure the existence of publicly accessible open space within walking distance of all residents.

F. Provide adequate access to the City's open space and recreation areas.

1. Determine which areas require additional, or improved, access.

2. Continue to provide public transit service to all major parks in the City.

3. Expand the development of sidewalks consistent with their role in providing both urban open space and access to urban open space.

G. Prioritize the maintenance and renovation of existing parks and recreation areas, and the development of new facilities so as to ensure equal access to these areas by all City residents.

H. Within the context of the park master plan, develop long range, strategic plans for the each of the City's parks and natural areas which address physical needs and outline a program for achieving these needs consistent with appropriate community planning processes. Long range plans should address the following issues for each park.

   1. Maintenance requirements.

   2. Priorities for funding improvements.

   3. Security.

   4. Design standards for facilities and structures.

   5. Appropriateness of and opportunities for expansion or reduction of park boundaries.

   6. Role of each park within the larger City and regional park system.

   7. Opportunities for regional cooperation.

   8. Management and staffing.

I. Develop and implement design standards for use when planning the development or renovation of publicly owned property including park and recreation areas, median strips, road rights-of-way, utility easements, vacant parcels, islands, floodplains and other environmentally sensitive areas as appropriate.

J. Develop public lands for use as parks in accordance with approved design standards.

   1. Identify public lands suitable for use as parks.

   2. Apply design standards to individual development projects as they are funded.

K. Plan for the availability of funding for parks and recreational facilities through a wide variety of funding techniques such as bond issuance, grant resources, conservation easements, and purchase of development rights.

L. Develop a mechanism, consistent with the park master plan, through which the City can encourage and accept donations of land, money, and other resources for use in preserving, maintaining, and expanding the park system.

Greenways

In the last two decades there has been a growing recognition that parks, open spaces, and other natural areas or cultural points of interest can become more accessible f they are interconnected as part of a system rather than existing in isolation. Community leaders have also found that previously neglected areas such as abandoned railroad rights of way or unused riverbanks can become valued parts of such a system for relatively little money.

This has evolved into the concept of a "greenway" network of open spaces connected by linear park-like strips, supplemented where necessary by sidewalk "greyways", to provide many miles of pathways through the city for walking, jogging, cycling and other forms of exercise or outdoor recreation. Greenways also serve as habitat and passageways for wildlife, thus affording them mobility, and expanded feeding and nesting grounds.

Development of a system of greenways raises many issues including liability and funding for property acquisition, construction, and maintenance. Access issues can often be handled by easement rather than outright purchase, volunteers can often aid in construction and maintenance, and materials can be donated.

The Richmond metropolitan area has been chosen by the National Park Service (NPS) to develop a metropolitan greenway plan with assistance through its Rivers and Trails Conservation program. The Metro Richmond Greenways Project is a cooperative regional effort being developed by an advisory committee of 40-50 individuals from the City of Richmond, the counties of Hanover, Henrico, and Chesterfield, area civic and environmental groups, and the National Park Service. The process envisioned for the completion of the project includes:

- Inventory and map existing resources using available data and the Council on the Environment's GIS system. This inventory and mapping was presented to the advisory committee in November 1991.
- Public meetings to generate public enthusiasm and ideas were held in February and March 1992.
- Goals and objectives were developed at the public meetings and then refined into actual plan elements in spring 1992.
- Approval of the plan is expected at the beginning of summer 1992.
- The actual mechanics of implementation will be in place at the end of summer 1992.

The environmental element recommends the greenway plan be adopted by City Council and incorporated into the previously defined master plan for parks and natural areas as well as into the City Master Plan.

Recommendations

A. Continue to be an active participant in the Metro Richmond Greenways project to develop a system of greenways throughout the City of Richmond to provide non-motorized linkages between parks, recreation areas, natural resources, trails, roadways, and cultural attractions; to provide habitat and pathways for wildlife; and to provide linkages with open space in adjacent jurisdictions.

B. Adopt the greenways plan as recommended by the Metro Richmond Greenways Advisory Committee and incorporate it into the City Master Plan and the recommended master plan for parks and natural areas accordingly.

C. Implement the greenways plan through the Capital Improvements Program (CIP), incorporation into City projects, and by seeking the support of private property owners for the donation of land and easements.

   1. Construct sidewalks as necessary to connect open space, recreation areas, and cultural attractions consistent with the greenways plan.

   2. Include sidewalks in street projects consistent with the greenways plan.

   3. Incorporate the ability to provide linkages or access consistent with the greenways plan into the design and construction of combined sewer overflow control projects, pipelines, and utility easements.

   4. Implement park and recreation area development and renovation projects through the CIP consistent with the greenways plan.

D. Designate the Department of Recreation and Parks as the agency responsible for the development and maintenance of a City greenways system.

   1. Provide adequate funding for the development and maintenance of the greenways system.

   2. Provide the Department of Recreation and Parks the means to delegate its authority for maintenance of the greenways system to other City agencies and private volunteer groups where appropriate.

E. Develop a mechanism by which private landowners can dedicate their property, or easements through their property, for public access or open space purposes consistent with the greenways plan.

F. Cooperate in the implementation of the greenways plan with the counties of Henrico, Hanover, and Chesterfield.

RIVER PROTECTION AND ENHANCEMENT

OBJECTIVE
PROTECT THE RECREATIONAL, AESTHETIC, AND ENVIRONMENTAL ATTRIBUTES OF THE JAMES RIVER CONSISTENT WITH ITS ROLE AS A UNIQUE URBAN WATERWAY.

The City of Richmond has approximately 24 miles of waterfront along the James River. Most of the land along the river's edge is in a natural state today. Even where adjoining property is developed, the river's edge itself is largely untouched, or has reverted to a naturally vegetated condition where it had previously been developed.

A large percentage of the riverfront is owned by the City as part of the James River Park system. Development has been discouraged on private properties by a number of constraints, including steep slopes, railroad rights of way, and severe floodplains. The City's Master Plan encourages protection of the riverfront in a general way, but for the most part, there have been no programs or regulations to ensure protection of this natural asset. The Chesapeake Bay Preservation Program recently adopted by the City now provides a regulatory tool to ensure water quality protection and preservation of the natural visual quality as well.

The issue regarding development of the James River waterfront is largely one of balance: how to use the unique assets of the river to add to the quality of life, to provide exposure to the river for recreation and education, and to serve as a catalyst for development and for the marketability of the City without despoiling the resource and without adding to the pollution of the Chesapeake Bay. In fact, it should be possible to improve water quality by preserving existing natural areas essentially as they are and by redeveloping existing intensely developed areas following the requirements of the Chesapeake Bay Preservation Program.

River Resources

The characteristics of the James River vary considerably over its course through the City. The riverbank offers excellent natural habitat for many plant and animal species, while the river harbors aquatic life. At the western edge of the City upstream of Boshers Dam the river is flat, slow moving, clean, and useable for swimming and boating much like a large lake. From Boshers Dam to the fall line at approximately the 14th Street Bridge the river is rocky and moves swiftly over rapids, offering a different recreational experience.

Through downtown, the character of the river's edge is alternately hard and urban, and soft and natural; and the river itself is a mixture of wild water, functioning bridges, and remnants of old bridge piers and dams. From the fall line to the downstream City boundary the river slows again, becomes tidal, and provides boating access all the way to the ocean. This section again becomes predominantly natural, punctuated at intervals by industrial structures or their docking facilities.

The tide change is normally between one and two feet in elevation, however, the banks are relatively steep, and the amount of shore exposed between tides is quite small in most areas. The only significant exception is a sandbar off the downstream tip of Chapel Island and a resulting small, unvegetated tidal flat. Almost without exception, the 7.1 miles of tidal shores within the City limits do not support aquatic vegetation.

The James River as it passes through the City of Richmond has been designated as a State scenic river. The City has been designated as the "administering agency" responsible for protection of the river's natural beauty in consultation with the "advisory board." The Falls of the James Committee, appointed by the Governor, serves as the advisory board and they are charged with assisting and advising the administering agency concerning the protection or management of the scenic river. The Falls of the James Committee has been investigating opportunities for pursuing national designation of the James River as a scenic or recreational river.

Shoreline Erosion

Normally, shoreline erosion is not a problem along most of the James River in Richmond. Annual bank erosion is so slight that the City has seen little need to construct erosion control structures in recent history except as part of protection and maintenance of riverbank park structures or bridges.

During flood events scouring and erosion occur in proportion to the depth and velocity of the floodwaters.

Vegetation, which naturally reestablishes itself, and soil are stripped away in some of the natural areas of the floodway during major floods. Man-made structures in the riverfront park areas also suffer from flood related erosion and sometimes are totally swept away.

Shoreline Erosion Control Structures

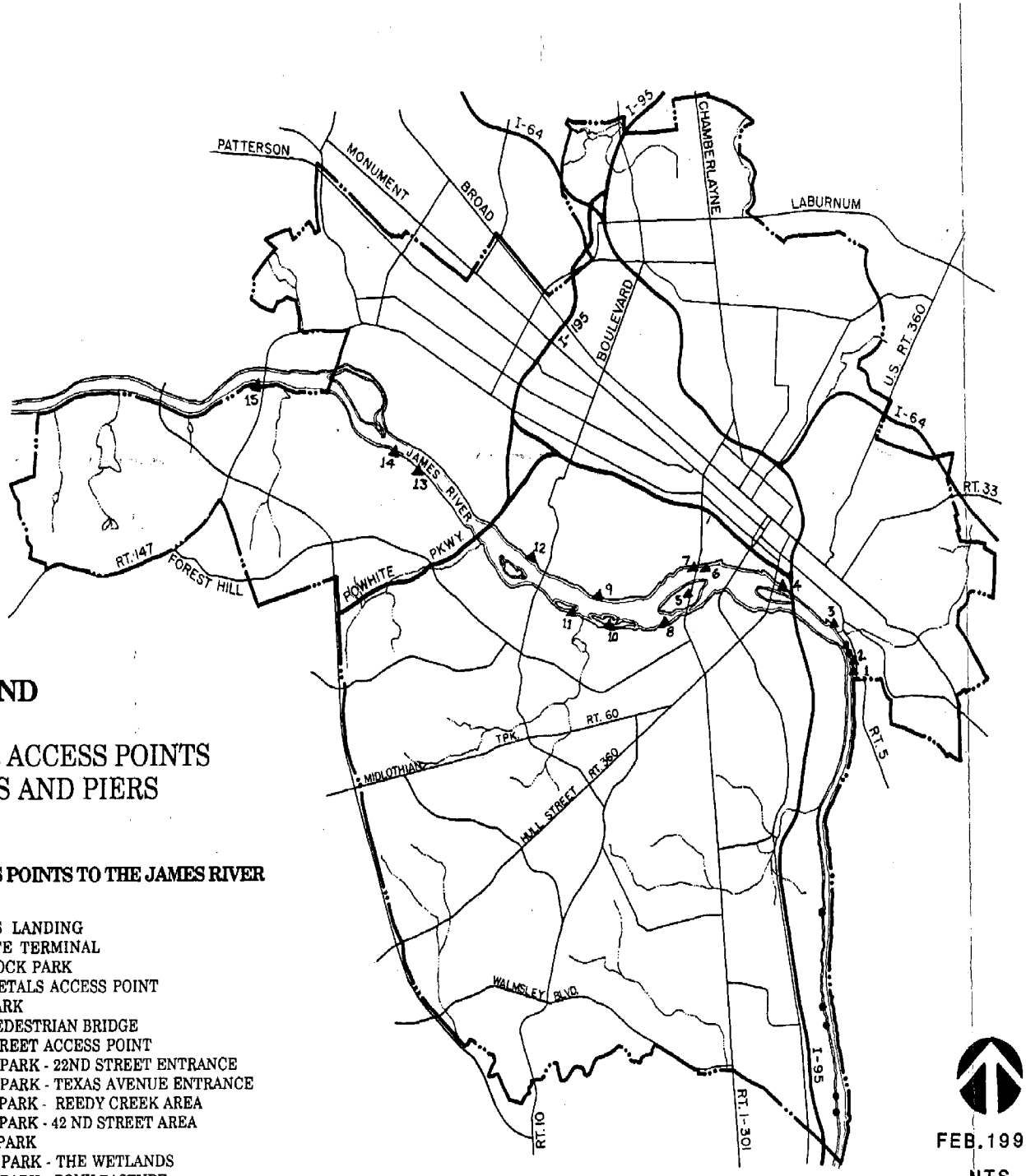
In the developed areas near Downtown rip-rap has been used to protect the banks of Browns Island, part of Chapel Island, and the James River Corporation properties. The base of the floodwall, where it abuts the river, is also being protected with rip-rap from the Manchester Bridge to the I-95 Bridge. Bulkheads constructed many years ago along the shore downstream of Chapel Island to the Intermediate Terminal serve as both docking facilities and erosion control structures.

Siltation occurs on a continuous basis just below the fall line as the river bends and loses velocity, dropping out silt carried from upstream. The Army Corps of Engineers (ACOE) maintains the river channel by periodic dredging up to the industries below Chapel Island and the Intermediate Terminal. Spoil from the dredging operation is currently deposited in a designated area on the southside adjacent to I-95. During the early part of this century a series of short jetties were constructed at intervals on the Henrico bank of the River from approximately the City line downstream for several miles. Little is known about these stone structures which apparently were built in an effort to control siltation patterns to seek to preserve the river channel and lessen the need for channel maintenance.

Density of Docks and Piers

There are approximately seven existing docks and piers within the City, the largest and most active of which are the Deepwater Terminal owned by the Richmond Port Authority, the Intermediate Terminal owned by the City, and two facilities used by Tarmac in their sand and gravel operations south of Chapel Island.

Three potential sites for public access and possibly marina development exist: on the north bank between Chapel Island and the City limits, and potentially at the two quarry sites on the south side (one south of the sewage treatment plant and one south of Goodes Creek) should the quarries become inactive. In addition to meeting the requirements of the Chesapeake Bay Preservation Program development of public access is required to meet strict standards regarding construction of utility hook-ups and pumping facilities as well as management requirements to guard against accidental spills or other emissions into the river. New construction of docks or piers elsewhere in natural areas will be discouraged.



LEGEND

▲ RIVER ACCESS POINTS
● DOCKS AND PIERS

EXISTING ACCESS POINTS TO THE JAMES RIVER

1. ANNCARROWS LANDING
2. INTERMEDIATE TERMINAL
3. GREAT SHIPLOCK PARK
4. REYNOLD'S METALS ACCESS POINT
5. BELLE ISLE PARK
6. BELLE ISLE PEDESTRIAN BRIDGE
7. TREDEGAR STREET ACCESS POINT
8. JAMES RIVER PARK - 22ND STREET ENTRANCE
9. JAMES RIVER PARK - TEXAS AVENUE ENTRANCE
10. JAMES RIVER PARK - REEDY CREEK AREA
11. JAMES RIVER PARK - 42 ND STREET AREA
12. PUMPHOUSE PARK
13. JAMES RIVER PARK - THE WETLANDS
14. JAMES RIVER PARK - PONY PASTURE
15. JAMES RIVER PARK - HUGUENOT FARMS

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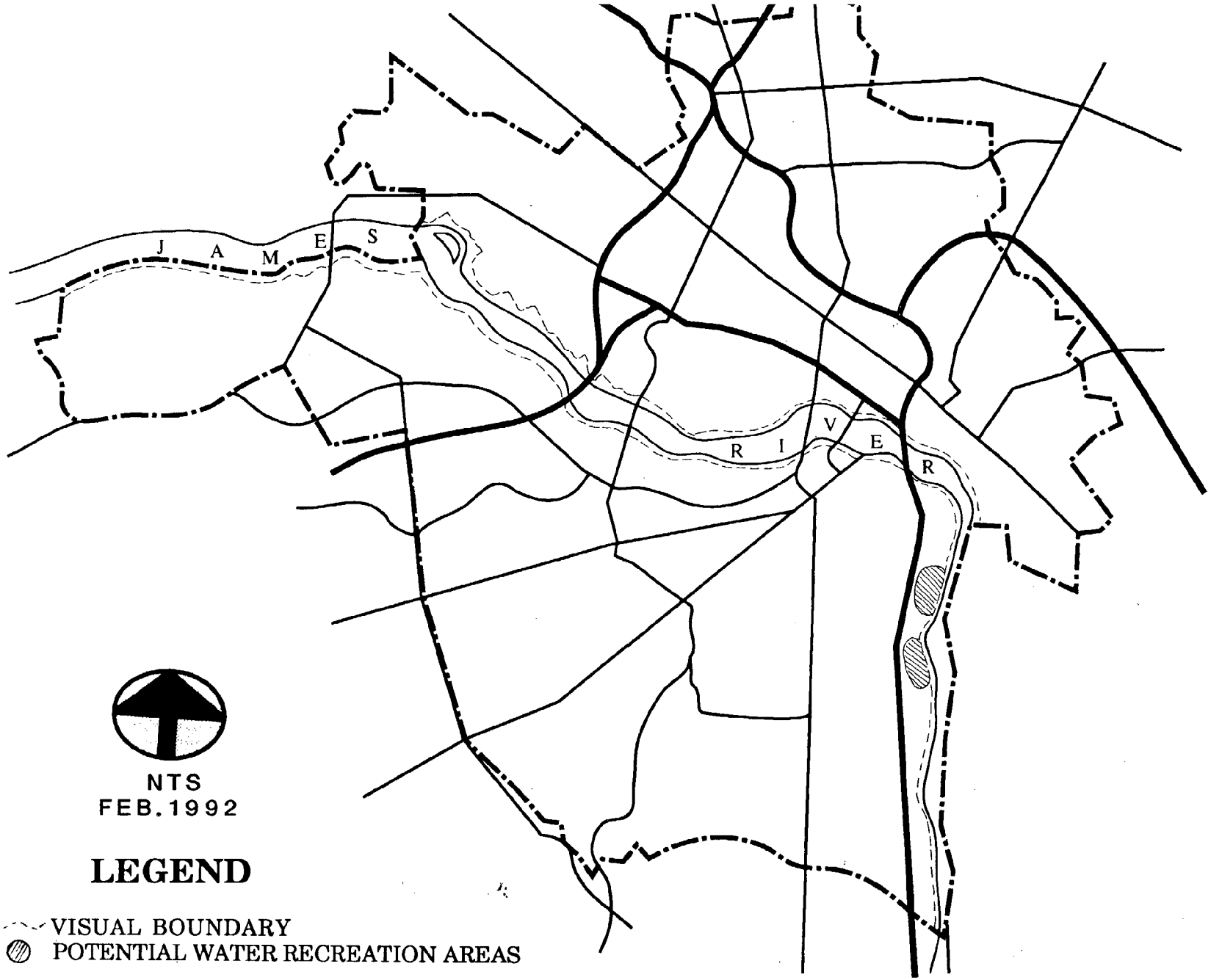
FIGURE



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LEGEND

VISUAL BOUNDARY
POTENTIAL WATER RECREATION AREAS

VISUAL BOUNDARY MAP

FIGURE _____

Riverfront Land Use and Development
In general, the City's policy toward development of the riverfront falls into two types of areas and intensities of development :

- Low intensity, natural areas developed to provide public access to the river and passive recreation activities only.
- Medium to high density, urban areas where most of the natural conditions have been removed and the river provides a development amenity.

Low Intensity, Natural Areas
Except for the Intensely Developed Areas (IDAs) noted on the Chesapeake Bay Preservation Areas map, most of the shoreline is natural and should remain in a natural state. Recreation, education, and interpretation of the river, natural marine and wildlife habitats, and adjacent woodlands and open space would be the primary activities.

All land within one hundred feet the river, or more depending upon the characteristics of the area, is designated as part of the Resource Protection Area (RPA) under the City's Chesapeake Bay Preservation Program. Only water-dependent uses or redevelopment of a site are permitted within the RPA. For water-dependent uses, any ancillary uses such as parking must be sited outside the RPA. The contemplated development must comply with the requirements of the Chesapeake Bay program, thus adverse water quality impacts will be minimized.

Restoration of the James River and Kanawha Canal is recommended as a means of providing additional public access to the riverfront and a recreational amenity of historic value. In addition, the conversion of Mayo Island into public open space is recommended due to its accessibility by City residents, including the handicapped, the availability of excellent fishing opportunities, and the potential for boating access.

Medium and Higher Density Development Areas
The Chesapeake Bay Preservation Program is geared toward encouraging development within the IDAs where a net improvement in water quality is gained through application of the performance criteria, particularly the stormwater quality requirements. IDAs have been designated on the north side of the river between the James River Corporation property and the eastern City limits, on the south side of the river between the Manchester Bridge and the I-95 Bridge, and at the Port of Richmond. Concentration of IDAs in these areas allows development which will contribute to the revitalization of Downtown and adjacent areas to occur while gaining a net improvement in water quality.

Richmond Floodwall

Development of the floodwall on the south bank of the river between the Manchester Bridge and the I-95 Bridge will put that portion of the riverbank in public ownership for the first time. Public access consists of a walkway which stretches between the Manchester Bridge and Brander Street with numerous overlooks providing spectacular views of the river and Downtown. The City is working with the Virginia Department of Game and Inland Fisheries to provide additional access to the river for fishing. Behind the floodwall commercial and industrial development is expected once the flooding threat is removed and revision of the floodplain designation is accomplished.

On the north bank the floodwall stretches between 12th and 21st Streets with pedestrian access points planned at Byrd Street just east of 12th Street, at 14th Street, and at Dock and 17th Streets. A river overlook is being constructed at Byrd and 12th Streets.

The environmental element recommends that additional riverfront access, including handicapped access to the water and to the wall itself, be provided in conjunction with the floodwall project. A program for proper management of the banks and their vegetation, which preserves the integrity of the floodwall while allowing re-establishment of the natural habitat, should be developed and implemented.

Recommendations

A. Develop a conservation and management plan which provides for the protection of the James River and its immediate environs.

   1. Develop and maintain an inventory of the characteristics of the river which make it worthy of protection.

   2. Identify and inventory the current status of land ownership and uses adjacent to the river.

      - Identify the potential uses of the land adjacent to the river which would be enhanced or curtailed through conservation and protection efforts.

   3. Develop and implement a conservation and protection mechanism, including seeking inclusion of the James River into the National Wild and Scenic Rivers System if appropriate and/or applying to the federal River and Trail Conservation Assistance Program for assistance in generating private landowner initiatives and enhancing state and local conservation efforts.

B. Enhance and preserve the free-flowing nature of the James River.

1. Determine the appropriateness and feasibility of removing remaining dams, obsolete bridge piers, and other structures which impede the flow of the James River.

2. Continue to pursue the construction of fish passages around obstructions to improve anadromous fish migration.

C. Develop a program for the protection of view-sheds and scenic horizons as seen from the James River.

1. Identify and designate areas for protection within the City Master Plan.

2. Develop and implement a protection mechanism similar to the urban design district overlay.

3. Incorporate appropriate standards for development within designated protection areas into existing review processes.

D. Utilize existing land use authority to implement protection needs.

E. Seek and support the development of in-stream flow standards sufficient to support indigenous aquatic life and recreational uses.

F. Seek and support legislation for additional control authority to apply river protection strategies and standards to development within the City of Richmond.

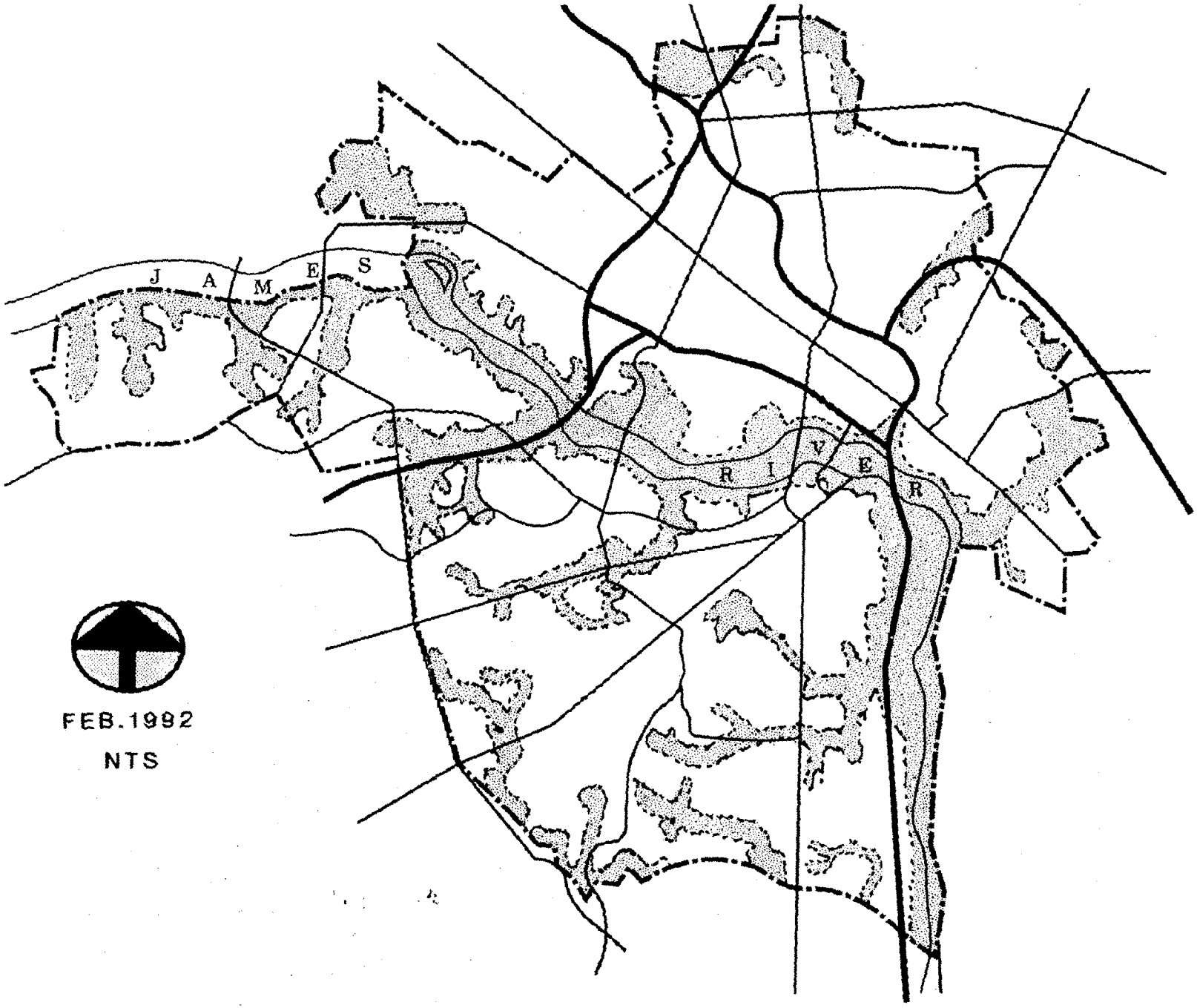
G. Designate an Environmental Protection Area as an overlay to the Master Plan which encompasses designated Chesapeake Bay Preservation Areas and other appropriate natural areas adjacent to CBPAs to create a larger network of natural open spaces in concert with the greenway plan.to accomplish the following purposes:

1. Protection of water quality through the Chesapeake Bay Preservation Program.

2. Protection of natural vegetation.

3. Development of continuous, non-motorized public access greenways or greenway linkages.

4. Protection of wildlife habitat, valuable visual open space, and other features which are environmentally sensitive.



ENVIRONMENTAL PROTECTION AREA MAP

H. Create an Environmental Protection District overlay to the zoning ordinance to require a review of all development plans within the designated Environmental Protection Areas.

GENERAL LAND USE

OBJECTIVE
INCORPORATE INTO THE MASTER PLAN ADDITIONAL LAND USE POLICY GUIDANCE AND INTO THE ZONING AND OTHER ORDINANCES ADDITIONAL REGULATIONS TO AFFORD GREATER PROTECTION TO ENVIRONMENTAL FEATURES CONSISTENT WITH THE OTHER OBJECTIVES OF THIS ENVIRONMENTAL ELEMENT.

The City of Richmond is almost completely developed in the sense that there are no major sectors or corridors of undeveloped land. There are remaining pockets of undeveloped land which are still in a natural state, although as the City continues to grow there will be increasing pressure to develop these last remaining open lands. This pressure arises from the operation of natural market forces as well as the City's need to increase its tax base through continued real estate development.

Constraints to Development
Unlike developing counties where there are large areas of vacant land and growth management tools can be used to channel development, the challenge for Richmond is to protect natural areas on a more site specific basis. Further development in most areas of the City is desirable from an economic standpoint; however, in areas which are sensitive or valuable from an environmental perspective development can be detrimental.

This potential conflict should be resolved in either of two ways:

- On some sites, or portions of sites, development should be prohibited altogether if possible; and

- in other cases, development can be designed to incorporate natural features in a manner which both preserves the features and enhances the development.

The City has many tools in its ordinances and review processes which affect the character of development; however, additional ordinances and review guidelines must be adopted to fully implement the objectives and recommendations identified in this plan. Several particularly important areas have been identified which need additional

protection and policy guidance to accomplish the desired objectives.

These areas include the banks of the James River throughout the City., key objectives for which are protection of water quality, protection of natural features from development, expansion of public access as appropriate, protection of aquatic and wildlife habitat, and protection of the natural visual quality of the riverbanks.

Other important areas include the extensive natural zones associated with the features in the Chesapeake Bay Preservation Areas. These natural areas are now afforded much greater protection than before adoption of the Chesapeake Bay program; however, broader policy guidance and authority to protect the other environmental values of such areas is desirable.

Steep slopes have been mentioned briefly under Environmentally Sensitive Areas as a feature which must be developed carefully to avoid adverse environmental impacts. Within Chesapeake Bay Preservation Areas, development on steep slopes may be prohibited completely; however, in other areas sloped sites can be developed responsibly provided that the soils are not highly erodible, and proper construction techniques and erosion and sediment control methods are used.

In general, soils can pose constraints to development. Reliable soils information is not available on a City-wide basis; however, currently upon application for a building permit a property owner or developer may be required to submit a soils survey conducted by a geotechnical engineer.

A potential protection tool may be to develop an overlay to the City land use plan to accomplish the following:

- establish clear policy objectives for such natural protection areas,
- coordinate existing regulations which might be used to accomplish these broadened purposes; and
- adopt additional regulatory controls to ensure sensitivity to environmental concerns during development review processes.

It may also be desirable to recommend changes in certain existing land use designations to help protect environmental features. These should be identified as part of a detailed review of the Master Plan.

Recommendations

A. Develop new policy guidelines to accomplish environmental objectives during the various plan review processes.

B. Incorporate the Metro Greenways system into a Master Plan district or overlay which furthers its development and enhancement.

C. Review the Master Plan for all planning districts to change land use designations with regard to the protection of natural features.

SOLID WASTE

Chapter 5

INTRODUCTION

In recent years the management of solid waste has become an issue of public concern. The problem of what to do with a community's solid waste is not new, but it has grown in significance for several reasons such as the continual growth in the quantity of solid waste generated daily (approximately 25,000 tons in Virginia), an increasing awareness of the environmental risks associated with traditional methods of disposal, the application of new more stringent environmental controls to reduce those risks, the difficulty of finding sites which are technically suitable and reasonably accessible to population centers, and increasing citizen opposition to the siting of solid waste disposal facilities within communities.

Most of the solid waste generated in Virginia is currently disposed of in landfills. In 1988 the Virginia Waste Management Board promulgated the Solid Waste Management Regulations which created stringent new requirements for the construction, operation, closure, and post-closure monitoring of all existing landfills, new landfills, and new sections of existing landfills. The requirements have substantially increased the costs of landfill disposal.

The regulations also establish a priority for solid waste disposal methods which places landfill disposal as an option in local or regional solid waste management planning after waste reduction (reduce volume of waste or its toxicity), reuse (products or materials), recycling, resource recovery (waste-to-energy), and combustion. Some of these alternatives may not be feasible because of the characteristics of the local waste stream, an absence of markets for certain recyclables, insufficient waste to justify a combustion facility, etc.

The objectives and recommendations of this chapter reflect the solid waste management hierarchy with an emphasis on waste reduction, recycling, and product reuse programs. Recognizing that even if the various recommended programs are implemented there will always be a need for some landfill capacity, resource recovery is recommended as a supplement to these programs and as being preferable to the continued dependence upon landfills for solid waste disposal.

GOAL

THE AMOUNT OF SOLID WASTE PRODUCED IN THE CITY OF RICHMOND SHOULD BE MINIMIZED AND DISPOSED OF IN AN ENVIRONMENTALLY RESPONSIBLE MANNER, CONSISTENT WITH THE SOLID WASTE HIERARCHY.

WASTE REDUCTION AND RECYCLING

OBJECTIVE
TAKE ACTION TO REDUCE THE PER CAPITA AMOUNT OF RESIDENTIAL SOLID WASTE PRODUCED IN THE CITY REQUIRING DISPOSAL AND TO INCREASE THE LEVEL OF COMMERCIAL, INSTITUTIONAL, AND INDUSTRIAL WASTE REDUCTION AND RECYCLING.

Waste Reduction
Waste reduction is an activity that prevents waste by reusing materials, lengthening a product's life, or pre-cycling (changing buyer or consumer habits). Waste reduction is the most preferred component of the solid waste management hierarchy. Several states have developed strategies for handling the problem of reducing waste at the source. Vermont, Oregon, Maine, and several other states already have some form of bottle bill. Ten states require that 6-pack yokes be made of photodegradable material. Berkeley, California and Suffolk County, New York have banned the use of certain kinds of plastic packaging. Portland, Oregon limits polystyrene food containers used by restaurants or other food vendors (compliance at the 2,200 restaurants in Portland is near 99%). Rhode Island, through the Rhode Island Solid Waste Management Corporation (RISWMC), has a comprehensive, four-tiered source reduction initiative:

- Education of manufacturers, consumers, and students as to the nature of the problem and what can be done to combat it;
- Regulations banning certain products from state purchasing;
- Legislation that has increased recycling efforts in the state; and
- Technical assistance offered to businesses that express interest in waste reduction.

In order for Virginia localities to implement such options for waste reduction they must have express authority granted by the State. Such an effort should be coordinated with other municipalities, the Virginia Municipal League, the Virginia Association of Counties, the Central Virginia Waste Management Authority (CVWMA), and the National League of Cities.

Another option is for localities to discourage waste generation overall by charging collection fees which vary according to the amount of waste put out each week. Most households currently pay a flat fee, or a fixed portion of their

real estate tax as in the City of Richmond, for collection. Consequently there is no incentive to reduce the amount of waste generated. Some jurisdictions are experimenting with fee systems. For instance Perkasie, Pennsylvania collects waste in pre-paid bags; the more waste generated, the more bags are required, which increases the fee. In Seattle, Washington households are paying for garbage collection by the pound; collection trucks are fitted with scales to weigh the cans as they are being loaded, while each address is recorded from a bar-code. An important factor in public acceptance of such waste reduction programs is the ready availability of recycling City-wide, as well as employment of an extensive public education campaign. In addition, if such systems were to be implemented in Richmond a reduction in real estate taxes would be necessary.

Reuse

Reuse is a waste reduction strategy where a product is used for the same or a new purpose without undergoing a physical change. The use of grocery store bags as household garbage bags is an example of reuse. Burning the bag and spreading the ashes in the garden is not reuse because the bag is then undergoing a physical change.

The reasons for pursuing reuse strategies are the same as those for waste reduction. Like waste reduction, reuse techniques help conserve landfill space, reduce dependence on expensive hazardous waste management practices, protect workers and the public, and enhance a business' or local government's public image.

Businesses may achieve reduction through reuse via inventory management and improved operations, modifying and redesigning equipment to enhance recovery and reuse, and establishing clearinghouses for excess materials and chemicals. The use of waste exchanges is another reuse strategy. Waste exchanges operate on the principal that "one man's trash is another man's treasure" and typically are operated by non-profit organizations which link waste generators with waste users.

Reuse is largely a matter of public education to encourage businesses, institutions, and citizens to change their habits.

Recycling

Recycling waste materials can accomplish the conservation of natural resources, save energy in the manufacturing process, offer cost avoidance savings over other waste management practices, reduce litter, and reduce water and air pollution associated with the extraction and processing of raw materials.

Recycling is a dynamic system comprised of the independent components of consumer purchasing, separation and collection, and manufacturing for reuse. Each of these components is critical to the success of a recycling effort.

- Consumer purchasing: encourage the purchase of recycled products to increase the demand for the collection of recyclable materials, and purchase goods and packaging that can be recycled through local collection programs.

- Separation and collection: separate recyclable materials from the Municipal Solid Waste (MSW) stream and make them available to collection programs such as recycling drop off centers or curbside collection.

- Manufacturing for reuse: the demand created by consumer purchasing can force manufacturers to switch to using recycled materials in their production processes in order to stay competitive in the marketplace.

It is a common misconception that the separation and collection of recyclable materials alone is "recycling." Recycling is a continuous system or cycle of purchase, consumption, separation (from non-recyclable waste), collection, marketing (return to manufacturing processes), remanufacture into a new product and, most importantly, purchase of that new product. Materials typically recycled include:

- Paper - newspaper, corrugated cardboard, high grade paper, mixed paper;

- Aluminum - cans, window frames, storm doors, siding, and gutters;

- Glass - green, brown, and clear;

- Ferrous metals - (iron and steel) cars, appliances, juice and food containers;

- Plastics - polyethylene teraphthalate (PET), soft drink bottles; high-density polyethylene (HDPE), milk jugs; mixed plastics or unsorted materials which contain contaminants such as paper, wood, glass and metal; and, other plastics such as polystyrene (Styrofoam), polyvinyl chloride (PVC), polypropylene (PP), and low-density polyethylene (LDPE);

- Batteries - lead-acid batteries from automobiles and household batteries;

- Motor oil; and

- Tires.

Yard Waste Composting qualifies as "recycling" with respect to meeting the state's recycling goals. Composting is a waste management technique involving the decomposition of leaves and brush which produces a humus-like material to be used as mulch, landfill cover or soil conditioner. Yard waste comprises an average of 18% of the annual U.S. waste stream; up to 50% in the spring and fall. It contributes to acidic leachate, methane gas buildup, and settling of landfills. Composting can be accomplished in two ways:

- Backyard composting: homeowners install a traditional compost pile on their property where yard wastes and degradable household wastes, such as food wastes, are composted.

- Centralized yard waste compost facility: leaves and grass clippings are accepted (on a regional or sub-regional basis) for composting; brush, stumps, and wood waste are chipped and sold as mulch or composted.

Composting can be accomplished by various techniques involving low, medium and high technology which require varying degrees of capital investment. Costs include land acquisition or improvements, labor, turning equipment, disposal of unacceptable materials, insurance, and marketing of the compost product. In addition, there are facility siting considerations which pertain to seasonal volumes; adequate storage space for windrows (elongated piles of composting material), the finished product, and equipment; buffer zone requirements to protect residents from odors associated with composting; and, environmental site considerations such as soil type, slope and drainage, distance from surface water sources, and depth to ground water.

Markets for compost product include the City's Department of Recreation and Parks, residents, apartment complexes, and commercial establishments. Product quality and supply is important to marketing compost. The product must have the proper purity, appearance, porosity, texture, consistency, and chemical balance. A consistent supply must be available in order to successfully market the product. Other options include making compost available to residents at little or no cost; requiring its use at municipal facilities, parks, and projects; and, specification of its use by private contractors performing land maintenance services for local governments.

Markets for Recyclable Materials

Recyclable materials are considered to be commodities: raw materials, or input into the manufacturing process. These materials directly compete with "virgin" materials such as

petroleum for plastics manufacturing and freshly cut trees for paper product manufacturing. As commodities, recyclable materials are subject to the law of supply and demand.

Markets for recyclable materials are the key to the success of separate collection programs. Identifying markets, securing agreements with materials brokers and end-users, and meeting buyer specifications are all part of marketing recyclable materials. In addition, recycling programs must be designed with the flexibility to handle fluctuating markets and uncertain outlets for materials. There are three general "outlets" for recyclable materials:

- Brokers identify end-users, accumulate materials, and guarantee that they can meet demand and certain specifications.
- End-users are facilities which actually process or manufacture the recyclable materials for reuse.
- Internal markets include municipal government agencies which not only provide an outlet for materials but promote recycling "awareness" within the government.

Recyclable materials are usually sold either on the open market or through some type of contract arrangement. In an open market situation, buyers are located each time enough material has been collected to be sold, thus the community can get the best price for the materials at the time. When markets are down the community may be faced with low prices or no buyers at all. In a contractual situation, a deal is made between the community and a broker or end-user involving the delivery of a certain amount of material at a certain price for a specified amount of time. This helps insulate the community from market fluctuations and ensures a reliable outlet for collected materials.

Cooperative marketing involves combining materials and resources from different groups or jurisdictions into a larger pool that may be more marketable. For example, the CVWMA is currently working on identifying and developing markets for materials collected as part of its various programs. The Authority is capable of either making arrangements for the delivery of recyclables collected in its thirteen member jurisdictions to a broker or end-user, or merely providing a link between the jurisdictions and the brokers, by serving as an information source.

It is recommended that the City take an active role in encouraging the existence of brokers and end users for recyclable materials, including hard to recycle items, through its economic development program. This action would bolster recycling efforts and provide an alternative to disposal by ensuring a destination for the waste products.

Recycling Legislation

Recycling is one of the most regulated solid waste management activities. Recycling, as referred to by many legislators, public officials, and the media is actually separation and collection of waste materials. Legislation such as mandatory material specific state-wide achievement rates, mandatory separation ordinances, labeling laws, bottle bills and landfill disposal bans on designated recyclable materials has been adopted in many areas of the U.S. Such legislation, which takes into account only one of the three major components of recycling (purchasing, collection, manufacturing), is merely a diversion technique which keeps waste from reaching landfills and does not guarantee that the collected materials will be marketed and remanufactured. Such legislation can therefore lead to the creation of a supply glut for those markets which traditionally utilize recycled materials in a manufacturing process.

Bottle bills historically have been viewed as litter control legislation, the logic being that people would think twice about throwing a bottle out the window if it could be redeemed for 10¢. Contrary to what many people believe, litter consists of much more than bottles and cans and should be controlled by other means, such as teaching people not to do it.

Virginia's Solid Waste Management Regulations mandate recycling goals as one component of an integrated waste management system. The bottle bill as it was introduced in the 1991 General Assembly, would detract from recycling as it is currently being implemented in that it removes recyclables from the waste stream, thereby driving up the cost of curbside recycling efforts.

One alternative may be to integrate the bottle bill with the current recycling legislation so that the two do not conflict with one another. It has been suggested that a bottle bill be initiated which applies in rural areas where community recycling programs are the least cost effective due to transportation costs. In contrast, areas with adequate density such as the City of Richmond are capable of collecting more recyclable materials through a curbside program than through a bottle bill.

City Recycling Programs

The City of Richmond currently employs a Chief of Environmental Management, located in the Department of Public Works, who also serves as the Recycling Coordinator for the City. In addition, the Clean City Committee Coordinator, in the Department of Community Development, has some recycling coordination duties. It is recommended that the efforts of these offices be consolidated to better coordinate waste reduction and recycling programs.

The City collects waste from approximately 80,000 households and small businesses which generate no more than 360 gallons (four 90 gallon supercans) of waste per week. Apartment complexes, condominiums, and large businesses must contract with private waste haulers. Approximately 30,200 households in the City participate in a voluntary curbside recycling program sponsored by the CVWMA, which collects newspaper, glass, aluminum, plastic, and bi-metal cans (see figure).

Additional recycling efforts include the transportation of tires picked up during routine street cleaning (at a cost of $1,000 per month) to a recycling facility; approximately 3.500-4,000 abandoned vehicles are collected and sold for reuse or scrap metal each year; most of the white goods collected on bulk waste collection days are recycled; approximately 800-900 gallons of motor oil from City owned vehicles are recycled per year; white office paper, aluminum, and newspapers are recycled in City offices; 5,500 Christmas trees were collected and mulched in 1990; and, City-sponsored telephone book recycling in 1990 collected 110,233 phone books.

Recommendations

A. Provide opportunities to facilitate total participation in recycling and waste reduction programs.

1. Consolidate the efforts of agencies responsible for waste reduction and recycling programs.

2. Encourage voluntary participation in the curbside recycling program.

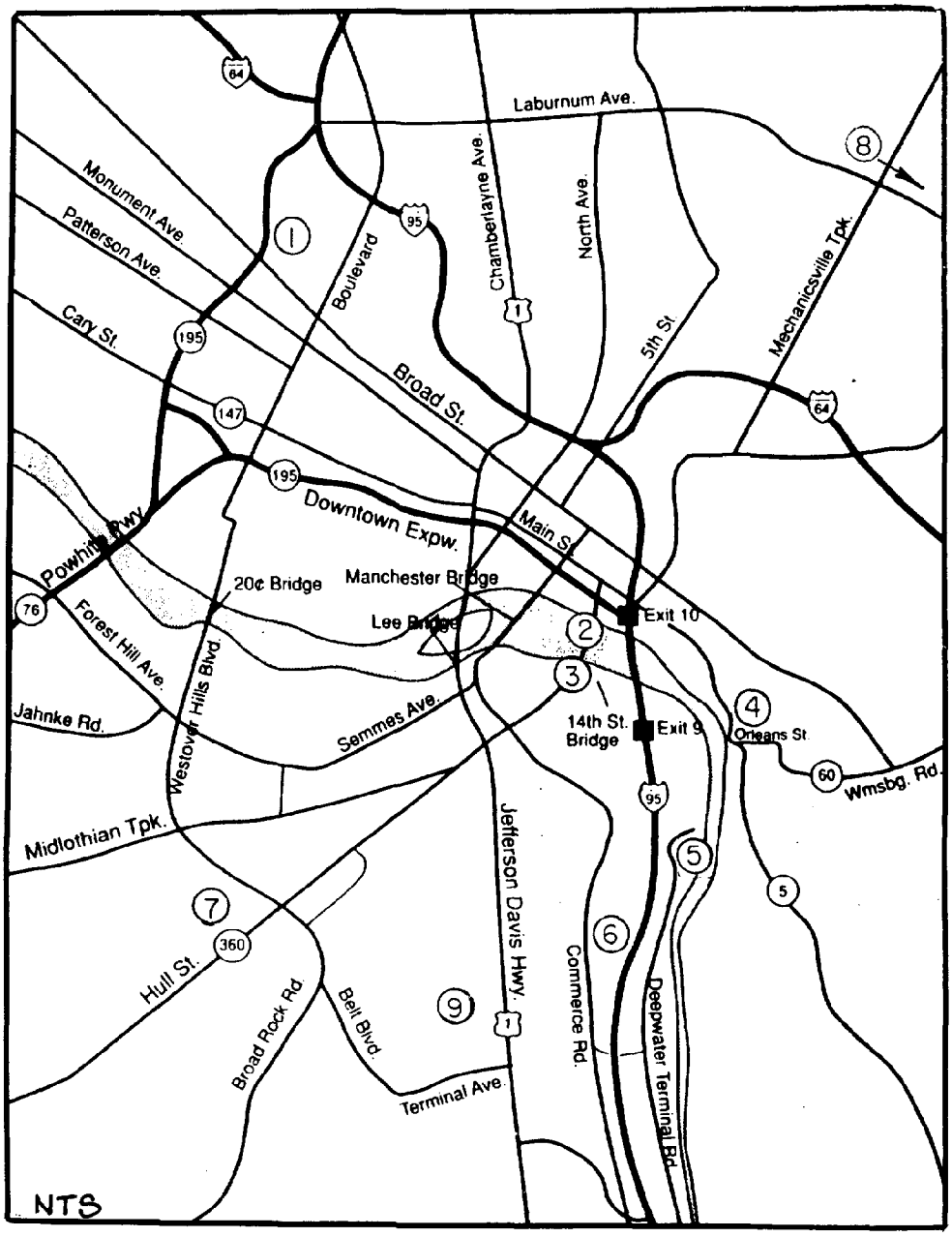
   - Utilize a public education and a notification system for non-participants to encourage participation.

   - Implement mandatory participation if voluntary methods fail.

3. Expand the voluntary curbside recycling program to include the entire City.

   - Complete an analysis which identifies the party responsible for undertaking this task and identifies areas appropriate for curbside collection expansion.

4. Implement mechanisms which encourage private waste haulers to provide recycling opportunities for their residential and commercial customers.



LOCAL RECYCLING CENTERS

1 SOUTHEAST RECYCLING CORP.
1402 BELLEVILLE ST.

2 REYNOLDS ALUMINUM RECYCLING CENTER
510 S. 14TH STREET, MAYO'S ISLAND

3 POCKET MONEY RECYCLING
701 HULL STREET

4 MANCHESTER PAPER RECYCLING, INC.
200 ORLEANS STREET

5 WEYERHAEUSER PAPER RECYCLING
1308 JEFFERSON DAVIS HWY.

6 SONOCO PRODUCTS
1402 BELLEVILLE ST.

7 REYNOLDS ALUMINUM-
MOBILE UNIT
SOUTHSIDE PLAZA S.CTR.

8 CHESAPEAKE CORP.
RICHMOND RECYCLING
LEWIS AND FERNCROFT RD.
HENRICO COUNTY

9 HOPKINS ROAD RECYCLING
CENTER

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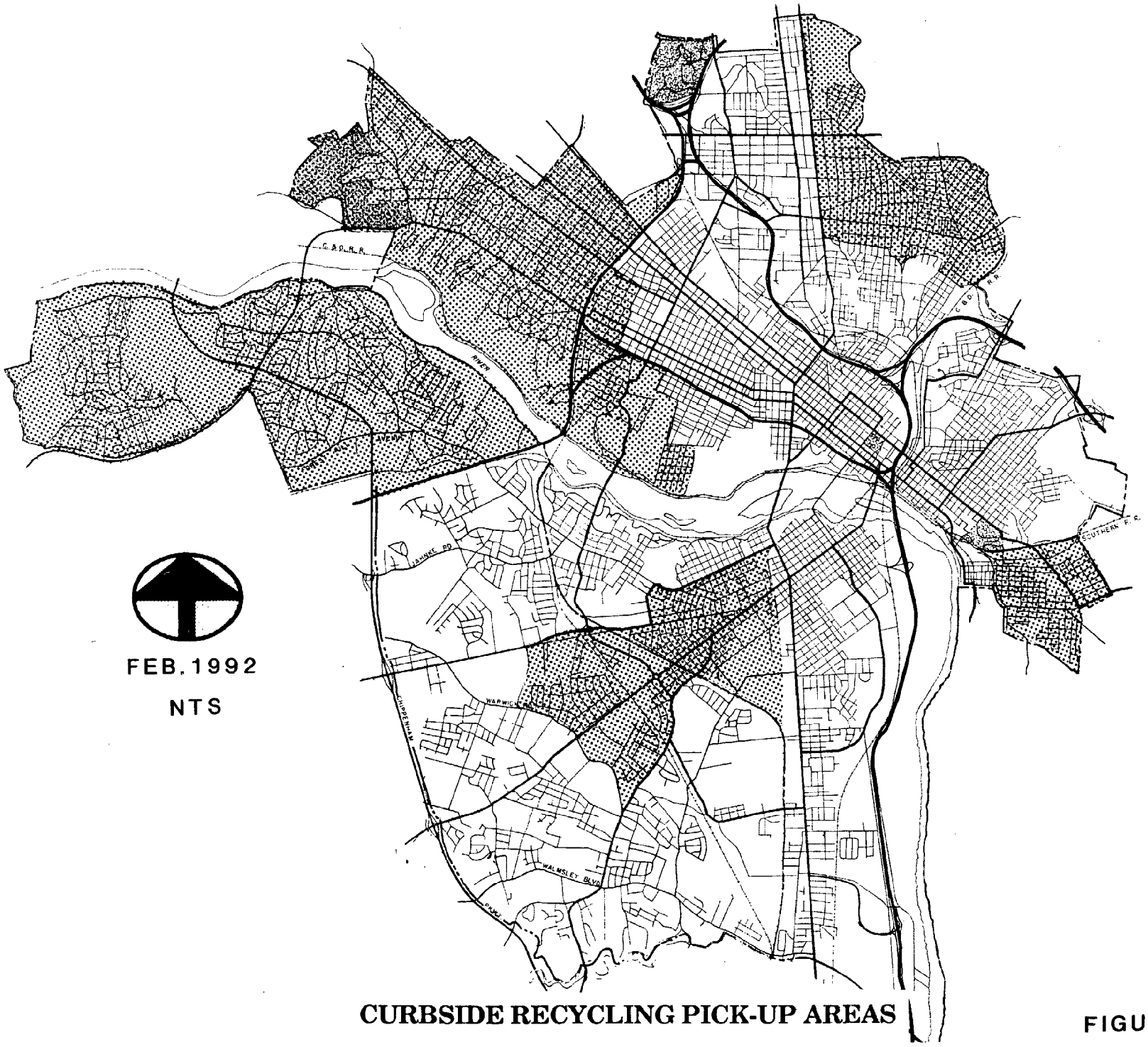
FIGURE _____



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CURBSIDE RECYCLING PICK-UP AREAS

FIGURE _____

- Investigate attaching provisions to business licenses requiring that recycling opportunities be provided by private haulers.

- Adopt ordinances and/or policies which facilitate the development of recycling centers within apartment complexes for tenant use.

- Adopt ordinances and/or policies which facilitate recycling for commercial customers.

5. Provide opportunities for the collection and recycling of special wastes (household hazardous wastes, white goods, tires, furniture, phone books, etc.).

   - Complete an analysis which identifies the party responsible for undertaking this task and provides guidelines for siting, design, and operation of special waste collection and recycling facilities.

   - Identify disposal alternatives, frequency of collection, and locations for special waste collection and recycling facilities consistent with the solid waste facility planning process.

6. Take action to encourage the reuse of products by citizens.

   - Encourage and facilitate the expansion of collection points of non-profit organizations currently involved in the thrift market.

   - Develop an arrangement which allows thrift companies, or other private agencies, "gleaning" privileges at special drop-off areas located at the City transfer stations, or other appropriate sites.

   - Investigate the development of a program, coordinated by the Clean City Coordinator, to regularly distribute used items throughout the City.

B. Provide facilities which encourage residential participation in recycling and waste reduction programs.

1. Provide additional drop-off centers to facilitate household recycling and supplement the curbside program.

   - Complete an analysis which identifies the party responsible for undertaking this task and provides guidelines for siting, design, and operation of drop-off centers.

- Identify locations for drop-off centers consistent with the solid waste facility planning process.

- Expand the number of drop-off centers to coincide with or precede the expansion of curbside collection.

2. Provide yard-waste composting facilities.

   - Complete an analysis which identifies the party responsible for undertaking this task and provides guidelines for siting, design, and operation of yard-waste composting facilities.

   - Identify locations for yard-waste composting facilities consistent with the solid waste facility planning process.

   - Maintain the municipal leaf collection program.

   - Expand Christmas tree collection and mulching program to include pick-up of other yard wastes year-round.

C. Develop markets for materials collected through curbside, drop-off and other recycling programs.

1. Investigate opportunities for development of markets for recyclable materials and special wastes.

   - Complete an analysis which identifies the party responsible for undertaking this task, identifies markets for recyclable materials and special wastes, and determines whether the region is able to offer a continuous supply of recyclable materials and special wastes to these firms.

   - Incorporate efforts to attract, retain, and expand the development of brokers and end user firms into the City's economic development program.

2. Identify borkers or end source markets for recyclable materials and special wastes.

   - Complete an analysis which identifies the party responsible for undertaking this task and identifies brokers or end source markets for recyclable materials and special wastes.

   - Incorporate efforts to attract, retain, and expand the development of brokers and end user firms into the City's economic development program.

3. Identify appropriate sites for brokers or end source firms, including possible sites within the City limits.

   - Complete an analysis which identifies the party responsible for undertaking this task; studies the compatibility of facilities with other land uses (specifically residential land uses); provides guidelines for siting, design, and operation of facilities; and identifies possible sites for vendors or end source firms consistent with the solid waste facility planning process.

   - If possible sites are identified within the City, the location of facilities must be consistent with the solid waste facility planning process.

D. Encourage source reduction and recycling through financial incentives and ordinance development.

1. Provide financial incentives for businesses which reuse or recycle significant portions of their waste stream or of the local waste stream.

   - Complete an analysis which identifies the party responsible for undertaking this task, identifies and pursues specific incentives which may be utilized, and identifies businesses eligible for financial incentives.

   - Provide business development assistance and consulting.

   - Incorporate incentive policies into the economic development program to attract businesses considering relocation, and to encourage business retention and expansion.

2. Implement mechanisms which encourage private waste haulers to provide recycling opportunities for their commercial, institutional, and industrial customers.

   - Investigate attaching provisions to business licenses requiring that recycling opportunities be provided by private haulers.

   - Adopt ordinances and/or policies which facilitate development of recycling centers for use by commercial, institutional, and industrial entities and their employees.

3. Seek and support legislation for additional control authority.

E. Promote efforts to encourage source reduction and recycling.

1. Encourage commercial, institutional, and industrial entities to change their procurement policies to increase the percentage of recycled materials/products purchased.

   - Complete an analysis which identifies the party responsible for undertaking this task; identifies the entities which administer specific procurement policies and investigates those policies; and determines how the City may influence changes in those procurement policies.

   - Promote expansion of procurement policies to include the purchase of other recycled goods or items made of recycled materials.

2. Encourage business and industry to voluntarily reduce the amount of packaging they use in their processes or products.

   - Complete an analysis which identifies the party responsible for undertaking this task; identifies which businesses and industries voluntarily reduce the amount of packaging they use in their processes or products; and identifies voluntary programs for packaging reduction and the use of alternative packaging techniques for locally sold products.

   - Hold information sessions with business and industry leaders in the City to stress why their cooperation is important.

   - Provide tax incentives to local businesses or industries which reduce the amount of packaging used in locally sold products.

   - Seek and support legislation for additional control authority.

RESOURCE RECOVERY

OBJECTIVE
PROMOTE COMBUSTION OF MUNICIPAL SOLID WASTE AS A SUPPLEMENT TO LANDFILL DISPOSAL.

Resource Recovery
Nearly every waste combustion unit being operated in the United States today is being used as part of a resource recovery effort. Resource recovery encompasses waste management technologies other than combustion, including waste to energy, removing recyclable materials from the waste stream (after collection) with a Materials Recovery Facility (MRF), or processing solid waste into fuel pellets (Refuse Derived Fuel) to be used by other waste to energy facilities.

Resource recovery facilities offer by far the preferred method of combustion because they are used in conjunction with a comprehensive recycling program. In a resource recovery effort, recyclables are pulled out of the municipal solid waste stream and the remainder is burned, thus reducing the volume of material making its way to a landfill. Resource recovery also offers the added benefit of providing a saleable commodity in the form of steam or electric power.

Resource recovery is considered a viable supplement to landfilling our solid waste. Resource recovery would be more practically accomplished on a regional level, through the Central Virginia Waste Management Authority. However, if the City is to advocate resource recovery on a regional basis, it is important that it be prepared to consider siting a combustion facility within the City limits.

Waste to Energy is a more limited form of resource recovery. It involves burning solid waste (including recyclables) to produce steam or electricity with the secondary benefit of reducing the volume of the waste stream. Both resource recovery and waste to energy produce a salable material that can be marketed. Industries may use the steam in a production process or in the heating/cooling system for their physical plants. A constant supply must be available to the customers and there must be a consistent demand for the steam produced. This demand is subject to seasonal fluctuations and the facility may have to be fitted with a bypass that allows for the process to be halted temporarily.

The term **incineration** implies burning waste, without converting the heat energy to steam or electricity, for purposes of volume reduction. The EPA has estimated that 75% of the municipal solid waste stream is combustible and

that this process reduces the volume of material that must be disposed of in landfills by 70 to 90%.

Types of combustion facilities:

- Mass burn combustion facilities require no preprocessing of the waste stream. That is, no separation of material is done before the waste is fed into the combustion unit. Mass burn units have a capacity of roughly 100-3,000 tons per day (tpd).

- Modular combustion units are units made up of smaller individual units. The most common number of units used is four. They also require little preprocessing of material. Modular facilities have a capacity of between 15 and 400 tpd (depending on the number of units).

- Refuse-derived fuel (RDF) units require that the refuse be mixed with some other material to produce a fuel. This extra step gives the opportunity to separate out recyclable products. Dedicated RDFs use only the waste material itself after separation of recyclables. Co-fired units use a mixture of waste material and coal. Mixed waste firing units use waste mixed with either coal or wood. RDF units have a capacity of 600-4,000 tpd.

There are currently eight combustion facilities located in Virginia: Alexandria, Fairfax County, Galax, Hampton, Harrisonburg, Norfolk, Portsmouth, and Salam. The Portsmouth facility is an RDF plant, the others are mass burn units.

Strict regulations exist at both the state and federal levels for controlling air emissions which occur during the combustion of municipal solid waste. Emissions include particulate matter, acid gases, nitrogen oxides, trace metals, and dioxins. Bottom and fly ash are the products of combustion and contain heavy metals, dioxins, and furans. Bottom ash, ash found at the bottom of the unit, is composed of 75-90% unburnable material. Fly ash, found in the stacks, is composed of lighter material suspended in flue gas. Emissions can be limited through the following practices:

- Ensure a good burn by operating the facility at peak efficiency and at maximum temperature.

- Use various filters and electrostatic precipitators to collect particulate matter that has been charged with electricity.

- Use a lime-spray based scrubber to control acid gases by coating the particulate matter with limed water and catching it in filter-bags.

- Efficient materials separation also cuts down on the amount of emissions produced. Lead batteries and certain plastics containing polyvinyl chlorides (PVCs) should be removed in order to ensure limited emissions.

The City must certify that proposed or expanded facilities are in compliance with local land use ordinances (the zoning and subdivision ordinances and the Master Plan), prior to State review of air permit and solid waste facility permit applications. Review of appropriate ordinances as required by the State permit review process is conducted by the Department of Community Development.

Recommendations

Resource recovery is recommended as a supplement to waste reduction, reuse, and recycling programs and as being preferable to the continued dependence upon landfills for solid waste disposal. Therefore it is recommended that the City promote resource recovery of municipal solid waste as a means of obtaining waste to energy and volume reduction benefits.

A. Investigate opportunities for development of a combustion facility.

   1. Complete an analysis which identifies the party responsible for undertaking this task, identifies markets for the energy produced by a combustion facility, and determines whether a City facility will continuously support these markets or if a regional facility is necessary.

   2. Consult with communities that have existing combustion facilities in place.

B. Identify which combustion process is most appropriate for the needs of the Richmond region (i.e. resource recovery, waste to energy, or incineration for volume reduction).

   - Complete an analysis which identifies the party responsible for undertaking this task, determines which components of the regional waste stream are appropriate for incineration and identifies an appropriate combustion process.

C. Identify appropriate sites for a combustion facility, including possible sites within the City limits.

   1. Complete an analysis which identifies the party responsible for undertaking this task; studies the compatibility of facilities with other land uses (specifically residential land uses); provides guidelines for siting, design, and operation of

combustion facilities; and identifies possible sites for a combustion facility consistent with the solid waste facility planning process.

2. If possible sites are identified within the City, the location of facilities must be consistent with the solid waste facility planning process.

LANDFILLING

OBJECTIVE
REDUCE THE NEED FOR LANDFILLING OF MUNICIPAL SOLID WASTE THROUGH THE PROMOTION OF WASTE REDUCTION, RECYCLING, REUSE, AND RESOURCE RECOVERY.

In the past 20 years major changes have occurred in landfill practices. The previous approach of "open dumping" was replaced by the concept of the "sanitary landfill," in which the waste is deposited, compacted, and regularly covered to reduce the more blatant impacts. Federal criteria for sanitary landfilling was established under the 1976 Resource Conservation and Recovery Act (RCRA). In recent years significant health and environmental risks have been identified with even sanitary landfills, especially as result of leachate and gas releases. Consequently, Virginia promulgated the Solid Waste Management Regulations in 1988 governing the siting, design, construction, operation, closure, and post-closure of landfills. New landfills were required to comply with the regulations immediately following the effective date (December 1988), while existing landfills were given additional time to come into compliance. The regulations have resulted in a significant increase in the cost of landfilling solid waste; however, the justification is that without the regulations, the cost to human health and the environment of improper waste management practices could be even greater.

Landfill Gas

Decomposing waste produces gases which migrate laterally and vertically through soil. If uncontrolled, the gases may escape to the atmosphere or follow voids in the soil, ultimately emerging into buildings or other structures. Landfill gas is composed of mostly methane and carbon dioxide, both of which are non-toxic; however, methane can reach explosive levels if allowed to accumulate in an enclosed area. Although landfill gases can be controlled it is impossible to eliminate all fugitive emissions. There are two types of gas control:

- Passive controls consist of trenches which are dug around the site. Perforated pipe is then laid in the trenches and covered with gravel. As gas forms it migrates to the pipes and is vented to the atmosphere.

- Active controls consist of blowers which are used to force the gases up and out of the landfill cells to a burn or filtration system.

A "normal" landfill will produce gas which is between 50%-60% methane for roughly 10-20 years. Methane can be collected and marketed as a low-grade fuel or it can be purified and sold as pipeline grade fuel. The economics of the methane recovery process depend upon the natural gas prices at the time of production.

Gas management is required by the regulations during the operation, closure, and post-closure of a landfill.

Leachate is a liquid which is produced when surface water and other waste liquids flow through the landfill and become contaminated by coming in contact with the waste. If left untreated, leachate can migrate off-site and contaminate groundwater and surface water. Leachate can be treated in three ways:

- At a publicly owned treatment works (POTW), where the leachate is added to the municipal waste water;
- on site, where the leachate is treated in a facility constructed as part of the landfill; and
- by recirculation, where the leachate is recirculated through the landfill. This speeds up the decomposition process but leaves the leachate to be dealt with at a later date.

The regulations require construction of a leachate collection system, including a double liner, and provision for leachate treatment during the operation and closure of a landfill. Groundwater monitoring is also required for all new landfills. If contamination is detected the landfill owner or operator must prepare and implement a corrective action plan.

Landfills in the City of Richmond

The City of Richmond does not currently operate a municipal landfill. Instead, the City is under contract until the year 2000 with the Chambers Development Company to dispose of the roughly 2,000 tons of waste produced each day in the City. The City picks up garbage from approximately 80,000 households and small businesses and transports the waste to one of two transfer stations in the City. Chambers is then responsible for transporting the waste from the transfer stations to its landfill in Charles City County.

The City owned and operated five properties as municipal landfills located at Richmond Road and Jenny Scher Road, School Street, 29th and Maury Streets, Pine Camp, and Whitcomb/Chelsea (Chelsea Village) (see figure). These landfills have been closed and are being monitored for methane and leachate production. Currently a portion of the School Street site is being used as a transfer station and construction of a municipal golf driving range is underway. The Whitcomb/Chelsea landfill is the site of a housing development which has had structural problems due to the instability of the site. Some more typical uses for old landfills are open space and greenways, recreation areas, municipal golf courses, and municipally operated nurseries.

Proposed privately owned landfills within the City must obtain the approval of City Council prior to their development. The City must certify that proposed or expanded landfill facilities are in compliance with local land use ordinances prior to State review of a solid waste facility permit application.

Recommendations

A. For that component of solid waste which must be landfilled, support operations which are in compliance with Federal and State mandates. Contract for landfill space only with those companies that have a proven record of environmental compliance.

   1. Identify those operators which have a proven record of natural resource protection and contract only with those companies.

   2. Write contracts so that a company violating Federal or State environmental laws would be in violation of the contract agreement.

   3. Develop a mechanism for monitoring contractors to protect the City from potential future liability.

B. For those sites which have served as either public or private landfills, develop a process for review which will determine the appropriateness of any proposed project and will identify any environmental hazards associated with such development.

   1. Develop ordinances with enforcement action to regulate development on closed landfills.

   2. Incorporate into the building permit review process a review of all project sites for the presence of landfills and the suitability of such sites for development.

- Require submission of environmental audit information and review of all projects developed on landfills by the Building Commissioner.

3. Complete an analysis which identifies appropriate uses for landfill sites.

   - Determine which sites may be appropriate for development as passive open space in conjunction with the park and open space master plan.

SLUDGE DISPOSAL

OBJECTIVE
CONTINUE DISPOSING OF SLUDGE IN AN ENVIRONMENTALLY SOUND MANNER.

Sludge is the semi-solid residue removed from sewage during wastewater treatment. Approximately 7.6 million dry tons of municipal sludge are disposed of in this country annually. Roughly 926,000 tons are applied to agricultural lands as fertilizer. The following methods are currently in use for the disposal of sludge:

- Incineration - Presently, more than 1.6 million tons of sludge are incinerated every year in the United States. This practice brings with it the increased costs of controlling the emissions produced and the disposal of the ash generated by the burn.

- Landfilling - Whether buried by itself or in conjunction with other materials, sludge uses up space in our already overtaxed landfills. Landfilling sludge also increases the potential for significant pollution of groundwater through leachate production.

- Land Application - Sanitary sewage sludge which has been properly treated and refined can often be applied to agricultural land as fertilizer. The amount applied and the composition of the sludge is tightly controlled by the State. Land application can be subdivided into four areas:

  - Application to forest land (either commercial or State owned);

  - Mixing with a bulking agent (usually wood chips) after composting;

  - Pelletizing, where the sludge is molded into pellets and used as home or commercial fertilizer; and

- Direct application to farmland.

Due to an extensive pretreatment program for industrial users of the sewage treatment plant, the City's sludge is free of toxics and other hazardous materials and is well suited for application to agricultural lands. The City currently pays to have its sludge removed from the sewage treatment plant. The contractor is responsible for conducting land application in compliance with State requirements.

Recommendations
This environmental element recommends that land application in compliance with State requirements continue to be the method of disposal for the City's sludge.

HAZARDOUS MATERIALS AND SPECIAL WASTES

OBJECTIVE
TAKE ACTION TO REGULATE THE TRANSPORTATION, STORAGE, AND DISPOSAL OF HAZARDOUS MATERIALS AND SPECIAL WASTES (PARTICULARLY HAZARDOUS, INFECTIOUS, AND RADIOACTIVE WASTES) WITHIN THE CITY.

Special wastes are items that require special or separate handling, such as hazardous wastes (both industrial and household), bulky wastes, used motor oil and tires, medical waste, and white goods (stoves, refrigerators, etc.). Special wastes cannot be disposed of in a municipal landfill.

Hazardous Materials are substances which, if handled or disposed of improperly, can pose a serious threat to health and the environment. Hazardous materials are not only industrial chemicals and materials, but common household items as well. Among the most common materials classified as hazardous are: all petroleum products, paints and coatings, solvent, cleaners and degreasers, pesticides and related materials, and most household and industrial chemicals. These materials must never be disposed of by pouring them down the drain or sewer, burning or burying in an unauthorized facility, or by including with regular solid waste.

The Superfund Amendment and Reauthorization Act (SARA Title III) sets forth various planning, reporting, and record keeping requirements concerning the management of hazardous materials. The act addresses disposal of such materials only incidentally by imposing reporting requirements for certain releases of hazardous materials. Under SARA Title III each state must have a State Emergency Response Commission. In Virginia, this requirement is being implemented by the Virginia Emergency Response Council (VERC) which is required to supervise

and coordinate local emergency planning activities, and establish procedures for receiving and processing requests from the public for information on the existence and location of hazardous chemicals and Extremely Hazardous Substances.

The VERC has divided Virginia into 114 Emergency Planning Districts. Each Emergency Planning District has a Local Emergency Planning Committee (LEPC) whose members are appointed by the VERC. The LEPC is responsible for developing an emergency plan for responding to releases of Extremely Hazardous Substances within the district.

EPA has identified over 600 substances that is classifies as Extremely Hazardous Substances, each of which has been assigned a corresponding Threshold Planning Quantity. If an Extremely Hazardous Substance is present at a facility in an amount equal to or in excess of the Threshold Planning Quantity, the facility is subject to SARA Title III's emergency planning and notification requirements and is called a Qualifying Facility. Owners and operators of Qualifying Facilities are required to notify the LEPC of any "relevant changes" at these facilities as they occur, and to provide the LEPC information necessary for developing and implementing the emergency plan.

In addition, any owner or operator of a facility required by the Occupational Safety and Health Act (OSHA) to prepare or have available Material Safety Data Sheets (MSDS), must submit copies of the sheets, or a list of chemicals covered by MSDS to the LEPC, VERC, and local fire department. These reports must include information on hazardous chemicals present in amounts equal to or greater than 10,000 lbs. (1000 gallons), and Extremely Hazardous Substances present in amounts equal to or greater than 500 lbs. or the established Threshold Planning Quantity listed for the substance, whichever is lower. MSDS give detailed information on what the hazardous material is composed of and how it should be dealt with in cases of emergency.

In Richmond, the LEPC has developed and maintains an emergency response plan for the City, which includes a database of all hazardous materials stored in quantities of 1,000 pounds. The Bureau of Fire is charged with administering the provisions of SARA Title III which include staffing the LEPC, keeping various records of hazardous materials stored in the City, disposing of them when necessary, and responding to emergencies that involve hazardous materials or waste. The number of incidents requiring the expertise of the "Haz Mat" team has been falling: in 1982, the year the Haz Mat Team was established, there were 100 incidents; in 1983 there were 118 incidents; and since 1983 there have been roughly 60

incidents per year. This decrease can be attributed to more stringent environmental regulations which have caused industry to be more responsive.

Hazardous Waste is defined as "solid or liquid wastes that may cause or contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness if handled improperly" or any waste which may "pose a substantial threat to human health." The Environmental Protection Agency is charged with determining whether or not a substance is a hazardous waste.

Hazardous waste has special characteristics which make it particularly hard to deal with:

- It is easy to hide poor hazardous waste disposal practices. Landfills are often, but not always, located on private lands and away from public scrutiny.
- Hazardous wastes can affect all environmental media. Exposure routes are often not direct and may involve several different avenues.
- Hazardous waste sites can continue to contaminate long after the facility has stopped accepting new waste.

If hazardous substances contaminate a site it then becomes subject to government clean-up under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund). There are 21 Superfund sites in Virginia, none of which are located in Richmond. The sites nearest to Richmond are:

- C&R Battery (Chesterfield County, Battery Reclamation site);
- Defense General Supply Center (Chesterfield County, Multi-spill site);
- H&H Burn Pit (Hanover County, Waste Burn Pit site); and
- Rentokil Site (Henrico County, Wood Preserving site).

CERCLA was promulgated to care for the estimated 27,000 abandoned sites contaminated with hazardous substances in the United States. CERCLA is unique in that it attempts to deal with past actions and identifies the EPA as both regulator and clean-up contractor. It is estimated that the average time required for identification, remediation, and delisting of a Superfund site is 12 years. The average cost of cleaning up a Superfund site is $30 million paid for by the individuals or corporations who have been determined to have contributed to the site, also known as potentially

responsible parties (PRPs). Liability for the contamination is strict, joint and severable, meaning that the "guilt" or intent of the responsible party is not a factor in determining liability. An individual may be held responsible for the entire cost of clean-up even though their individual contribution was very small.

The EPA has generated a list of potential Superfund sites called the Comprehensive Environmental Response Compensation Liability Information System or CERCLIS list. These sites have been identified by the EPA as possible contaminated sites requiring remediation. There are between 500 and 600 sites on the Virginia CERCLIS list, approximately 12 of which are located within the City of Richmond (see figure).

The CERCLIS list is maintained by the Department of Waste Management and is one component of the Virginia Superfund Program. This program has a two-part process: pre-remedial and remedial phases. The pre-remedial phase begins with site discovery and involves a site investigation called a Preliminary Assessment. Sites which appear to represent a threat to human health or the environment undergo a more intensive investigation called a Site Inspection. Information from the inspection is used to rank sites using the EPA Hazard Ranking System. Sites above a designated score are listed on the National Priorities List (NPL) and are eligible for cleanup using Superfund money. The remedial phase of the program includes a remedial investigation and feasibility study, development of remedial design, completion of remedial action, and delisting of the site.

Medical/Infectious Waste

It is estimated by the EPA that 3.2 million tons of medical waste are produced in the United States each year. The Virginia Department of Waste Management does not maintain information regarding the actual amount of waste generated daily in the Commonwealth or in the City of Richmond.

The Resource Conservation and Recovery Act (as amended in November 1988) provides for a Demonstration Medical Waste Tracking Program which is applicable to the states of New York, New Jersey, Connecticut, the states contiguous to the Great Lakes, and any state included through petition. For the purposes of this program, medical waste is defined as any solid waste which is generated in the diagnosis, treatment, or immunization of human beings or animals. To date, Virginia has not petitioned for inclusion in the program.

In advance of a federal mandate, the Virginia Waste Management Board promulgated the Infectious Waste Management Regulations in May 1990 which define infectious waste as any solid waste which is identified by the health care professional in charge as capable of producing an infectious disease in humans, or if it is one of the following controlled infectious wastes: cultures and stock of microorganisms and biologicals; blood and blood products; pathological wastes; sharps; animal carcasses, body parts, bedding and related wastes; any residue or contaminated soil, water, or other debris resulting from the cleanup of a spill of any infectious waste; and, any waste contaminated by or mixed with infectious waste. This definition is not quite as broad as the RCRA definition of medical waste. Any medical waste that is not regulated by the Infectious Waste Management Regulations falls under the jurisdiction of the Virginia Solid Waste Management Regulations.

In Virginia, all persons who generate infectious waste, own or operate infectious waste management facilities, or allow infectious waste management facilities to be operated on their property must dispose of their waste in accordance with the Infectious Waste Management Regulations. The regulations do not apply to health care professionals who generate infectious waste in the provision of health care services in their own office or in the private home of a patient, provided the waste is disposed of as authorized. Health care professionals are required to dispose of such waste in one of three ways:

- Personally transport, or have an employee transport, the waste to a hospital where the practitioner has privileges for disposal on site, either through incineration or steam sterilization.
- Personally transport, or have an employee transport, the waste to the practitioner's office for sterilization and disposal with regular municipal solid waste.
- Contract with a licensed firm for disposal.

Hospitals dispose of approximately 85% of their waste on site (70% is incinerated and 15% is steam sterilized). Typically, 15% is sent off site for disposal. The greatest danger from medical waste is usually considered to be to those who transport or directly handle the material. There is little evidence to support the supposition that medical waste posses any threat to the general public. According to the U.S. Department of Health and Human Services, the viruses that transmit Hepatitis B, AIDS, and other diseases are very fragile and cannot withstand the conditions found inside a well-maintained, properly operated incinerator.

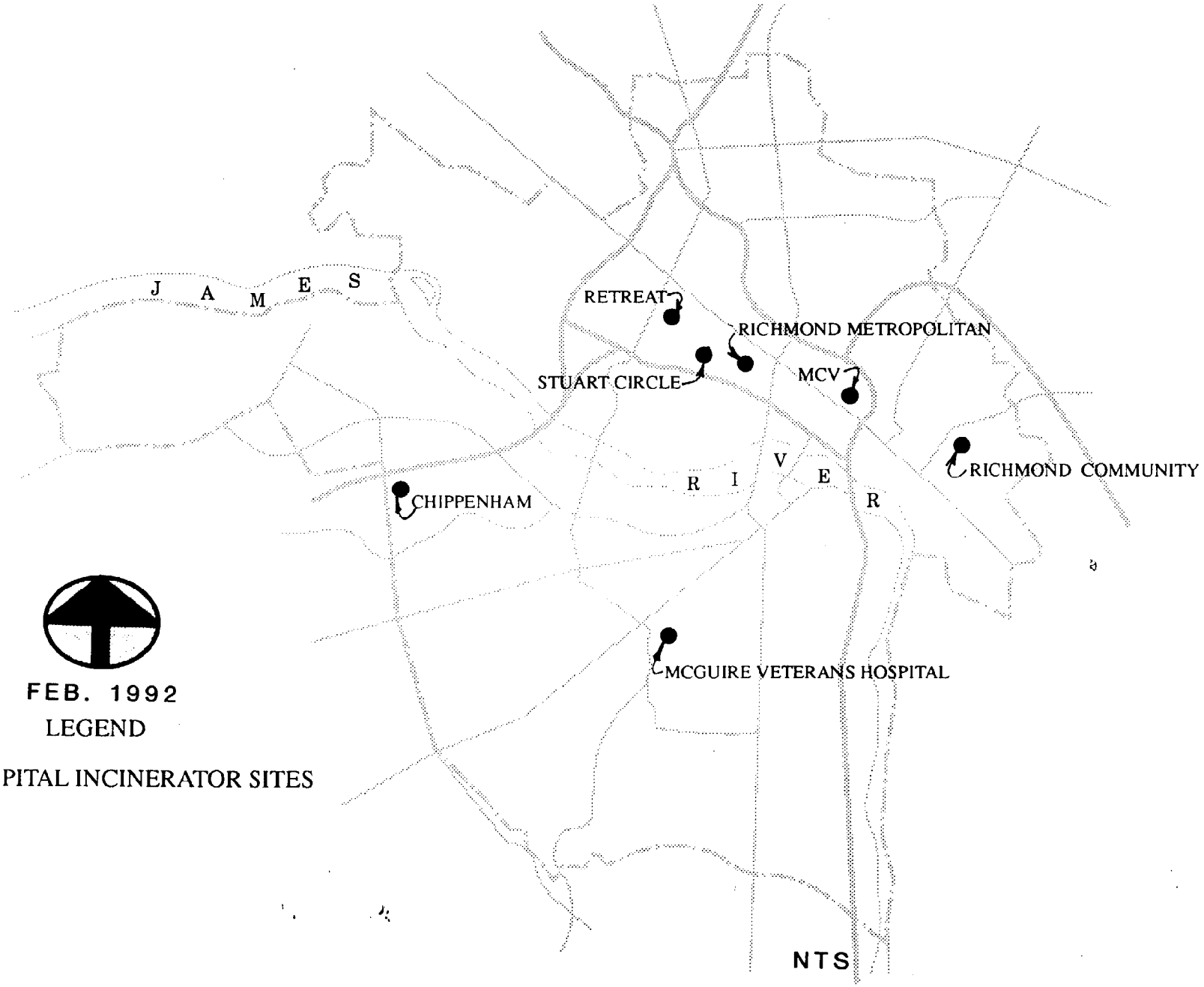
The Infectious Waste Management Regulations state that infectious waste must be subjected to burn temperatures of not less than 1400 degrees Fahrenheit for not less than one hour. The resulting ash must be tested once every eight hours. If it is determined that the waste is "hazardous" it must be disposed of in accordance with the Virginia Hazardous Waste Management Regulations. If it is not found to be hazardous it may be disposed of in any facility permitted by the Department of Waste Management to accept garbage or ash. The results of this testing procedure must be kept on file for three years.

The biggest problem associated with the incineration of both medical waste and municipal solid waste is the emission of particulate matter and gases. Some questions remain about what harmful effects, if any, are associated with the incineration of medical waste. Medical waste may be higher in dioxins and furans due to its large plastic content; however, a report prepared for the EPA in 1989 stated that, "[t]he dominant emissions from medical waste incinerators...are substantially less than for solid waste systems."

There is only one independent medical waste incinerator operating in Virginia, the Incindere, Inc. facility, located in Norfolk, with a capacity of 65 tons per day (tpd). As of March, 1991 six other independent medical waste incinerators had proposed opening in Virginia:

- Metropolitan Funeral Services, located in Alexandria, with a 6 tpd capacity;
- Mercer Vault Company, located in Fredericksburg, with a 9 tpd capacity;
- Unimed of Virginia, located in Richmond, with a 46 tpd capacity;
- Virginia Environmental Corp., located in Hopewell, with a 46 tpd capacity;
- Recovery Corporation of Virginia, located in Emporia, with a 50 tpd capacity; and
- Caselin Systems, Inc., located in Bland County, with a 40 tpd capacity.

Seven hospitals in Richmond operate medical waste incinerators on site: Chippenham Hospital, Medical College of Virginia, Stuart Circle Hospital, Retreat Hospital, McGuire Hospital, Richmond Metropolitan Hospital, and Richmond Community Hospital (see figure).



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LEGEND

● HOSPITAL INCINERATOR SITES

HOSPITALS WITH ON-SITE INCINERATION

FIGURE _____

Hospital incinerators are considered to be "auxiliary uses" by the City and may be used to burn only waste that is produced on-site. In addition, these six facilities are qualified to operate under a "permit by rule," meaning they are not subject to the permit application and issuance provisions of the Infectious Waste Management Regulations; however, they are required to comply with all other provisions of the regulations. Only those facilities that are in complete compliance with all of the following conditions are qualified and considered to be operating under a permit by rule:

- The facility and all infectious waste activities must be in compliance with all parts of the Infectious Waste Management Regulations except for Part IX, Permit Application and Issuance Procedures.
- More than 75% (by weight, per calendar year) of all infectious waste that is stored, treated or disposed of by the facility is to be generated on-site.
- No infectious waste is to be transported or received by the facility without being properly packaged and labelled in accordance with these regulations.
- The activities at the facility must not involve the placing of infectious waste directly into or on the land.
- The owner or operator of the facility must notify the DWM in writing that the facility is operating under a permit by rule and provide information regarding the location of the facility; the type of business the facility serves; and the type of facilities involving infectious waste in terms of its treatment, storage, transportation, and disposal.

A permit by rule will be immediately terminated when the facility fails to fulfill any of the above conditions.

There are two mortuaries within the City of Richmond which have crematorium facilities: Forest Lawn Cemetery and the Virginia Division of Consolidated Laboratories. The activities of these facilities are specifically excluded from regulation by the Infectious Waste Management Regulations: human remains properly interred in a cemetery or in preparation by a licensed mortician for internment or cremation are not considered to be infectious waste.

Other Special Wastes

Motor oil is a special waste that is easily recyclable. One-half of the energy needed to refine crude oil is needed to re-refine used motor oil; and one gallon of used oil can make the same amount of lubricating oil that 45 gallons of crude oil can produce.

In Virginia, businesses that sell motor oil are required to post signs informing citizens of recycling locations. The City recycles approximately 800-900 gallons of motor oil from City owned vehicles per year.

Tires are easily recyclable. They can be ground and used in asphalt, used as retreads, playground equipment, or can be chipped/shredded and used as a source for rubber goods. In addition, they can be used as fuel sources in cement kilns, pulp and paper plants, or power plants.

Each year, 200 million tires are discarded and often find themselves in landfills or tire dumps. Tires take up considerable space in municipal landfills, tire dumps are prime breeding sites for vermin and mosquitoes, and there is a danger of the tires catching fire.

The Virginia Department of Waste Management is currently developing a tire management program which will establish tire recycling centers throughout the Commonwealth. In the City, tires picked up during routine street cleaning efforts are recycled at a cost of $1,000 per month for transportation of the tires to a recycling facility.

Construction and demolition waste is relatively safe. Most of it is inert; however, precautions must be taken with waste that contains asbestos, PCB bearing transformers and oil, lead, paints, and treated lumber.

White goods are discarded appliances which are usually shredded and the material recycled into new steel. Again, some electrical components may contain PCBs and must be removed before recycling. The City recycles most of the white goods collected on bulk waste collection days.

Recommendations

A. Develop and implement mechanisms to regulate the transportation, storage, and disposal of hazardous materials and special wastes within the City.

   1. Establish appropriate truck routes for transporters of hazardous materials and special wastes.

   2. Coordinate designation of special truck routes with the City's Haz Mat team and the Local Emergency Planning Committee.

B. Contract for transport of hazardous materials or special wastes only with those companies that have a proven record of environmental compliance.

   1. Identify those operators which have a proven record of safety and natural resource protection and contract only with those companies.

2. Write contracts so that a company violating Federal or State environmental laws would be in violation of the contract agreement.

3. Develop a mechanism for monitoring contractors to protect the City from potential future liability.

C. Develop and implement mechanisms to regulate the storage of hazardous materials and special wastes within the City.

1. Continue to maintain the hazardous materials reporting system for the storage of materials in quantities greater than the Threshold Planning Quantity as required by SARA Title III.

2. Develop reporting requirements for storage of less than the Threshold Planning Quantity of hazardous materials.

3. Develop guidelines for the appropriate siting of facilities which store special wastes and hazardous materials.

   - Consider type of material or waste, location of facility, condition of physical plant, surrounding land uses, distance between storage facilities and adjacent uses, and suitability consistent with the solid waste facility planning process.

4. Determine the compatibility of facilities which store special waste and hazardous materials with other land uses, specifically residential uses, consistent with the solid waste facility planning process.

   - Develop ordinances which regulate the siting of facilities which store special waste and hazardous materials.

5. Include the City Fire Bureau in the review of all permit applications made for facilities which store or handle special wastes and hazardous materials.

   - Identify the types of land uses for which permits should be routed to the Fire Bureau.

6. Establish a schedule for monitoring of facilities which store hazardous materials or special wastes to ensure compliance with the zoning ordinance and permit conditions pertaining to such storage throughout the life of the facility.

7. Amend the zoning ordinance, revise existing review processes, or adopt additional ordinances to implement mechanisms which regulate the storage of hazardous materials and special wastes within the City.

   - Include the Fire Bureau in the amendment, revision, and ordinance development processes.

8. Review the zoning districts within the Environmental Protection District to determine the appropriateness of permitted uses within those areas.

   - Require that within the Environmental Protection District any land use which is storing hazardous materials or special wastes have appropriate containment facilities.

9. Seek and support legislation for additional authority to further regulate the storage of hazardous materials and special wastes through the building code and additional ordinances.

D. Develop mechanisms which hold the shipper and carrier responsible for the clean-up costs in a hazardous materials or special waste incident.

   1. Utilizing existing authority, require payment of clean-up costs where the City is forced to contract for clean-up.

   2. Consider adopting ordinances which include enforcement action.

E. Promote the inclusion of Virginia in the Demonstration Medical Waste Tracking Program.

CENTRAL VIRGINIA WASTE MANAGEMENT AUTHORITY

OBJECTIVE
SUPPORT AND SUPPLEMENT THE SOLID WASTE MANAGEMENT EFFORTS OF THE RICHMOND REGIONAL PLANNING DISTRICT COMMISSION (RRPDC) AND THE CENTRAL VIRGINIA WASTE MANAGEMENT AUTHORITY (CVWMA).

Richmond has chosen to comply with the Virginia Regulations for the Development of Solid Waste Management Plans by joining twelve other local governments in the Richmond/Petersburg Metropolitan Statistical Area in forming the Central Virginia Waste Management Authority (CVWMA or the Authority). These

thirteen local governments have worked with Richmond Regional and Crater Planning District Commissions, an environmental planning and engineering consultant, a local Technical Advisory Committee (composed of public and private waste management and recycling experts) and a Citizens Advisory Committee to develop a regional waste management plan which defined the Authority's role as well as general waste management programs for the region.

The plan was submitted to the State in December 1991 and is meant to satisfy requirement for a solid waste management plan defining not only how and what the region will recycle, but also how it will manage the rest of the waste stream. State planning requirements include exploration of alternative management systems and their feasibility for a wide array of waste materials.

The plan addressed all elements of solid waste management including generation, collection, transportation, treatment, storage, and disposal. It did not address infectious, hazardous, or radioactive wastes. The plan stressed voluntary approaches for meeting State mandated recycling objectives, rather than regulatory and mandatory approaches.

The Authority's first project since incorporation in December 1990 was the introduction of a regional pilot curbside recycling program targeted to serve approximately 18,600 households (approximately 30,200 in the City of Richmond) within seven of the thirteen member jurisdictions. The program began in April 1991 and is expected to run for three years.

Programs in the developmental stages include:

- Introduction of a regional recycling drop-off center network utilizing a private vendor to service existing and additional drop-off centers.

- Development of a regional Materials Recovery Facility (MRF) to prepare recovered recyclable materials for the secondary market.

- A feasibility study has been undertaken by the environmental planning and engineering consultant which will determine potential and strategy for production of yard waste compost and wood waste mulch on a regional or sub-regional basis.

- Other activities include expansion of the curbside program, office paper recovery, restaurant glass and plastics recovery, used tire recycling, and multi-family drop-off centers.

The environmental element recommends that RRPDC and the CVWMA explore solid waste management technologies other than recycling and landfilling in future planning for the region. Specifically, the waste management hierarchy components of source reduction, reuse, and resource recovery should be carefully considered as alternatives to landfilling the majority of the regional waste stream.

Recommendations

A. Promote the incorporation of an integrated waste management system, consistent with the solid waste disposal hierarchy, into the regional solid waste plan.

1. Encourage the CVWMA to develop and implement a regional program for the promotion of residential, commercial, industrial, and institutional source reduction, recycling, and reuse.

   - Actively participate in and contribute to the planning efforts of the RRPDC and the CVWMA.
   - Promptly provide any information required by the RRPDC or the CVWMA in their planning efforts.
   - Supplement CVWMA program gaps with City programs.

2. Promote the serious consideration of regional resource recovery as a viable supplement to landfilling.

   - Actively participate in and contribute to the planning efforts of the Richmond Regional Planning District Commission and the CVWMA.
   - Promptly provide any information required by the RRPDC or the CVWMA in their planning efforts.

B. Promote the development of a comprehensive solid waste management education program for use on a regional basis.

1. The CVWMA, in conjunction with local universities, should form an environmental clearinghouse to both act as an information repository and to disseminate information on solid waste management issues to localities that request it.

2. The CVWMA should establish a peer matching program so that the communities of the region can

share their expertise and information on solid waste management issues.

AIR QUALITY

Chapter 6

INTRODUCTION

Six out of every ten people in the United States live in an area which fails to meet air quality standards set to protect human health. Virginia's natural resources have been affected by the decline in air quality: emissions of sulfates from power plants causes a scattering of light which reduces visibility in the Shenandoah National Park; and nitrogen disposition from motor vehicles, power plants, and other combustion sources has caused a decline in the water quality of the Chesapeake Bay. This situation exists despite 20 years of air pollution control efforts.

The Clean Air Act (CAA) of 1970 established national standards for six criteria pollutants: sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), lead (Pb), and particulate matter with a particle size of less than ten microns in diameter (PM-10). States were made responsible for monitoring air quality for these pollutants and for implementing plans to meet the federal standards. Generally this approach worked: air pollution sources were monitored and air quality improved.

If an area does not meet the standard it is classified as a nonattainment area and control measures must be imposed to bring the area into attainment. Richmond, Chesterfield, and Henrico were designated nonattainment areas for ozone in the late 1970's. The 1970 CAA made no distinctions between areas just barely in violation of the standard and areas which greatly violated the standard. In both cases the same length of time was given to reach attainment status, this proved to be an inequitable and unworkable situation.

The following table provides ozone standard exceedance data for the Richmond Metropolitan Area between 1981 and 1990.

RICHMOND METROPOLITAN AREA
1981-1990 OZONE TREND
NUMBER OF DAYS THE STANDARD OF 0.12 PPM WAS EXCEEDED AT EACH MONITERING STATION

MONITORING STATION LOCATION	'81	'82	'83	'84	'85	'86	'87	'88	'89	'90	Total last 3 yrs.*
Chesterfield County Beach Road	1	0	5	1	0	0	1	4	0	0	4
Henrico County Math & Science Ctr	0	1	0	2	0	0	0	3	0	0	3
Hanover County Raven Run Subdiv.	0	1	4	1	1	0	4	9	0	0	9
Charles City County Shirley Plantation	--	--	--	--	--	--	--	5	0	1	6

*0.12 ppm standard not to be exceeded more than three times in three years.

The 1990 amendments of the CAA classify nonattainment areas according to the severity of their pollution and give an appropriate length of time to achieve attainment. Specific emissions control programs must be implemented within the various classes of nonattainment areas. All applicable sources in that area must comply with the CAA-mandated control programs which are increasingly stringent as the area classification increases in severity. In addition, the control measures are additive: those required for one category are added to the controls required in areas ranked below it in severity.

The 1990 CAA amendments designate nonattainment areas based upon 1987-1989 data. If an area was designated nonattainment prior to enactment of the 1990 amendments, such as Richmond, the area is automatically considered to be nonattainment under the new amendments.

Nonattainment designation involves both the determination of the geographic boundaries of the area and the assignment of a classification for the area. Each area designated nonattainment is classified at the time of designation as marginal, moderate, serious, severe, or extreme, depending upon the severity of the pollution. Richmond has been classified as a moderate nonattainment area for ozone. In comparison, Hampton Roads is classified as marginal, northern Virginia as serious, Baltimore as severe, and Los Angeles as extreme.

Ozone is created by a reaction between nitrogen oxides (NO_x), volatile organic compounds (VOCs), and sunlight; it is not emitted directly into the atmosphere as are other pollutants. Typically, the gases are emitted in one area and the chemical reaction, stimulated by sunlight and temperature, occur in another. Which is why monitoring for ozone in the Richmond metropolitan area is conducted in Hanover, Henrico, Chesterfield, and Charles City counties.

Control of VOCs is the most direct way in which to reduce ozone levels. Volatile Organic Compounds originate from three primary sources: point sources (30%), area sources (20%), and motor vehicles (50%). Point sources, primarily industries, emit VOCs from various processes which use solvents, paints, oils, and other chemicals to make a product. Area sources are small emitters including dry cleaners, repair facilities, and print shops as well as numerous household goods such as point, oil, charcoal lighter fluid, hairspray, and deodorants.

The following chapter provides an information base for the review of Richmond's responsibility toward improving air quality. Policy recommendations are made and actions which will enhance the air quality of the Richmond area are suggested. Certain actions are mandatory, others are desirable but outside of the City's ability to control at this time, and still others simply make good economic sense.

GOAL

THE AIR IN THE CITY OF RICHMOND AND ITS ENVIRONS SHOULD BE OF THE HIGHEST QUALITY.

VEHICULAR EMISSIONS

OBJECTIVE

PROMOTE ACTIVITIES WHICH REDUCE THE LEVEL OF VEHICULAR EMISSIONS AND ENHANCE AIR QUALITY.

The present transportation system in the United States contributes significantly to the threat of global warming and increased air pollution. The fossil fuels used by vehicles are a major source of greenhouse gases, with carbon dioxide being the most prevalent. Nearly 25% of all CO_2 emissions and nearly 13% of all chloroflurocarbon (CFC) emissions in this country can be traced to vehicles. In addition, vehicular emissions are a major contributor to the formation of ozone.

According to the EPA, there are three options for controlling the emission of air pollutants by automobiles:

- Improving the fuel efficiency of automobiles and transportation systems.
- Converting to alternative fuels that produce little or no CO_2 or CFCs.
- Switching to more energy-efficient modes of travel.

Improved Vehicle and System Efficiency

Doubling the fuel economy of a vehicle reduces its CO_2 emissions by one-half. In 1973, when the first oil crisis occurred, the average fuel economy of new cars was 14 miles per gallon; today, it has roughly doubled with a corresponding drop in the amount of emissions. Experimental vehicles have been produced that are capable of achieving 60-75 mpg. While they were not designed for mass production, these cars clearly demonstrate that we can do much better than the 28 mpg that is the average for automobiles produced today. Making automobiles lighter in weight, increasing the efficiency of engines and transmissions, and reducing aerodynamic drag are all ways of increasing energy efficiency.

Improved control of traffic lights and traffic patterns also offers increased fuel efficiency. Fuel is wasted in stop-and-start traffic that is typical of many downtown areas. The City of Richmond, in cooperation with the Virginia Department of Transportation, is currently developing a computerized system for traffic signal control in the downtown area at an estimated cost of $5 million. It will interconnect 240 of the 420 signals located in the City and will decrease congestion and idling time at intersections. It is hoped that this system will be fully operational by 1993.

Alternative Fuels

Use of clean and viable alternative fuels is another option which can reduce vehicular emissions. Some alternative fuel types include hydrogen, bio-mass based fuels (ethanol and methanol), and electricity from non-fossil fuel sources. There are several short-term problems with alternative fuels.

- Electric cars have a short range and run on electricity usually produced by fossil-fuel burning generating plants.
- Methanol produces as much CO_2 per unit of energy burned as does gasoline.
- Compressed natural gas reduces CO_2 emissions; however, it is difficult to store and may produce insufficient power for large vehicles.

- Ethanol produces no CO_2 emissions; however, the technology needed to use it is very expensive.

- To produce the amount of ethanol needed to have a significant effect on air quality, a large amount of land presently used to grow food crops and forests would have to be diverted to produce feedstock.

Use of alternative fuels by itself will not help control air pollution on a global scale; however, it can improve local air quality.

More Efficient Modes of Transportation

Over 70% of all trips taken today in the United States take place in a vehicle with only one or two passengers. A major shift to mass transit would help alleviate some of the problem of vehicular emissions; however, within the United States the use of the car so far exceeds the use of mass transit that if mass transit systems were tripled in sized and were used at peak capacity, the energy used for passenger transportation would fall by only 10%. A more promising alternative would be to increase the load factor, or increase the number of persons travelling per car per trip. Today, the load factor in the United States is 1.7 persons per car per trip. If that average were increased to four, energy use would drop by 45%.

Efforts to increase transportation efficiency are typically referred to as transportation system management and transportation demand management techniques. Transportation system management (TSM) strategies increase the transportation system's capacity through improvements to infrastructure or facilities. Examples of TSM include HOV lanes, improved signalization, and electric streetcars. Transportation demand management (TDM) strategies reduce vehicular demand upon the transportation system through the modification of travel behavior. Examples of TDM include flex-time, tele-commuting, establishment of car and van pools, and bus routing and scheduling.

Other alternatives are to increase the use of bicycles and walking as forms of transportation. These alternatives are 100% efficient in their use of energy, are non-polluting, and have the added benefit of providing exercise. Implementation of the greenways plan (referenced in the Natural Features chapter) will provide pathways and connections throughout the metropolitan area to facilitate walking and bicycling as transportation.

The City is required under the CAA amendments to install Stage II control systems to recover gasoline vapors at its fueling stations. The City is also required to participate in a basic Inspection and Maintenance (I/M) program for its motor pool vehicles. The Department of General Services is considering investigating the use of natural gas and other alternative fuels in some City-owned vehicles; however, present technology inhibits conversion of the entire fleet at this time for practical reasons. The City administration reassigned 30 parking spaces previously reserved for car and vanpools. The City is reviewing the possibility of re-implementing the car and vanpool parking program in conjunction with the new Virginia State Library and the attendant parking deck.

The Greater Richmond Transit Company (GRTC) has no immediate (within the next five years) plans to begin investigating the use of alternative fuels. The cost of converting its operations and fleet are seen as being too high and the currently available technology is not sufficient to meet demands. GRTC is pursuing grant funding to enable them to begin an experimental program with alternative fueled buses. GRTC currently uses emission traps on some buses and new buses that are purchased already meet the emission standards set by the CAA amendments. Diesel exhaust and particulate matter are all currently within allowable levels under the CAA amendments. Under the CAA amendments alternatively fueled, low polluting buses may be required in moderate nonattainment areas (such as Richmond) if EPA determines that model year 1994 buses are not capable of maintaining their pollution standard for the life of the vehicle (250,000 miles).

Recommendations

A. Promote the use of mass transit by residents and workers in the City of Richmond.

1. Evaluate and modify bus routing throughout the City at regular intervals to better serve the riding population and encourage further ridership beyond the transit dependent.

2. Cooperate with the other jurisdictions within the Richmond region and with existing regional organizations to develop satellite parking facilities which assist in the use of the bus system, and car and van pools.

3. Modify the downtown public transportation system to incorporate use of an electric trolley system or other alternatively fueled vehicles with peripheral connections to the City-wide system.

4. Review development plans with the consideration of a proposed project's ability to be served by mass transit.

B. Develop Transportation System Management (TSM) and Transportation Demand Management (TDM) programs which promote air quality and the efficient use of fuel.

1. Develop HOV lanes on heavily travelled commuter routes where possible for use during rush hour.

2. Provide incentives and facilities which promote the use of car and van pooling by public and private sector employees.

3. Continue to place a priority on funding traffic management system improvements throughout the City to increase the efficiency of traffic flow.

4. Coordinate with major employers to decrease the automobile commuting usage by employees through provision of car and van pooling, mass transit, flex time, tele-commuting and other TSM and TDM techniques.

C. Convert the City of Richmond vehicle fleet to alternatively fueled vehicles as soon as practical.

D. Convert the GRTC bus fleet to alternatively fueled vehicles, including electric vehicles (trolleys, buses, etc.), as soon as practical.

E. Conversion to alternatively fueled vehicles should be based on the following factors:

1. Applicability and appropriateness of technology

2. Financial feasibility

3. Regulatory requirements

4. Practical and logistical considerations

F. Develop incentives for conversion of private vehicles and vehicle fleets to alternatively fueled vehicles.

G. Seek and support legislation for additional control authority to apply TDM incentives for development and use of mass transit, transportation systems, and conversion of private vehicles and vehicle fleets to alternatively fueled vehicles.

H. Consider employment of additional measures to encourage increased efficiency in transportation modes.

1. Encourage the development of easily identifiable bicycle and pedestrian routes and signage through the zoning, plan of development, and special use permit review processes, and the Capital Improvement Program.

2. Provide car and van pool parking spaces for City employees.

3. Provide financial and/or development incentives for private employers to establish car and van pool programs.

4. Consider using smaller vehicles as alternatives to buses during late-night hours.

5. Encourage entities with which the City is connected, such as the Richmond Metropolitan Authority and Richmond Redevelopment and Housing Authority, to provide reserved spaces and reduced rates for car and van pools in their parking facilities.

I. Develop a public education campaign which promotes the use of mass transit, use of flex time by major employers within the City, and car and van pools.

J. Investigate methods for reducing the amount of particulate matter from diesel vehicles and other non-point sources not covered by the CAA amendments.

ENERGY GENERATION

OBJECTIVE
ACHIEVE CLEAN AND ENVIRONMENTALLY SOUND METHODS OF ENERGY GENERATION.

Three types of fossil fuel are used in energy production: coal, fuel oil, and natural gas. Of these, coal is the "dirtiest," producing more SO_2, VOC, and NOx emissions which contribute to global warming and the formation of acid rain. Fuel oil also burns "dirty," producing significant amounts of these primary air pollutants. Natural gas burns the "cleanest" of the three but still produces some emissions. The generation of energy using fossil fuel combustion contributes to acid rain, global warming, and the formation of ozone. The use of alternative power (i.e., alternative nuclear power, solar, wind, and bio-mass) would go a long way toward reducing harmful emissions; however, there is no economic incentive to switch to these alternatives at present. Currently, the technology required for the efficient and cost-effective production of energy through the use of alternative power is considered to be too expensive.

Acid Rain

Acid rain is present in any form of wet or dry precipitation (rain, snow, fog, dust, etc.) that is more acidic than normal. It is formed when sulfur oxides and nitrogen oxides are released into the atmosphere and interact with sunlight, moisture, and other pollutants to form weak solutions of sulfuric and nitric acid. Acid rain is seldom a problem in the immediate vicinity of the sources of sulfur and nitrogen dioxides. Rather, these pollutants are collected in one area and transported through the atmosphere to be deposited in the form of acid rain in other locations. Acid rain is a problem identified mainly with the Northeast United States, but its effects can also be seen in Virginia.

The sulfur and nitrogen compounds that contribute to acid rain come from both natural and man-made sources. Among the natural sources are: lightning, ocean spray, decaying plant matter and bacterial activity, and volcanic eruptions. The man-made sources include: electric utilities, industries, businesses, homes and other entities that burn fossil fuels, emissions from automobiles and other forms of transportation, and other industrial processes, such as smelting. These man-made emissions account for more than 90% of the total emissions in the eastern part of North America.

Acid rain may cause fatal abnormalities in fish and amphibian eggs and may kill algae and other organisms that serve as food for fish. It may also damage the leaves of trees and other plants and may slow their growth. Acid rain is also a danger to buildings and statues. Acidity and moisture react with stone to form a crust that is easily chipped or washed off. Statues can lose their features and buildings can lose an outer layer of stone. Acidic water can also corrode metal pipes, leading to contamination of drinking water.

Virginia is fortunate in that its soils contain a large amount of limestone. This acts as a filter for some of the acid that is deposited; however, it has been estimated that between 20% and 60% of the limestone capacity of the the state's soils has already been used.

The 1990 CAA amendments require that sulfur dioxide emissions be reduced ten million tons annually from the levels emitted in 1980 by the turn of the century; approximately a 40% reduction. The legislation also calls for a two million ton reduction in nitrogen oxide emissions by the year 2000. A significant portion of this reduction will be accomplished by utility companies, which will be required to meet tougher emission standards.

Since the majority of the acids which contribute to the acid rain problem come from coal-fired power plants, the greatest amount of work aimed at reducing acid precipitation has been directed toward pollution control technologies required during the permitting process. These include the use of scrubbers (which can reduce SO_2 emissions by 95%), the pre-washing of coal, and more reliance on low-sulfur coal (mined in Virginia and the far Western U.S.).

Other methods that are being investigated include Limestone Injection Multistage Burners (LIMB), more advanced scrubbers, in-duct spraying, and fluidized bed combustion.

Global Warming

Global warming is the warming of the earth's climate due to an increase in the amount of atmospheric carbon dioxide, methane, ozone, and chloroflurocarbons (CFCs). Chloroflurocarbons are used in refrigeration units including units used to cool buildings. These gases act much like the panes of a greenhouse, trapping heat near the earth's surface and raising the ambient temperature. Elevated levels of these gases are the result of the world-wide burning of fossil fuels, the destruction of bio-mass (particularly rainforests and old-growth stands), and the use and release of aerosols, refrigerants, and cooling agents.

Scientists are still not in agreement about what, if any, effects the gradual warming of the earth will have. Among the anticipated effects are:

- A gradual melting of some of the polar ice caps, and a rise in tides and sea level;
- changes in agricultural production (deserts may expand to include greater land area, but at the same time areas previously too cold for crop production may warm); and
- changes in the earth's climate in general, including changing weather patterns, variation in established winds and currents, and changes in precipitation amounts.

Given the global nature of the problem, some efforts have been made at finding large-scale solutions. In 1987, the "Montreal Protocol on Substances that Deplete the Ozone Layer" was signed. This protocol mandates significant reductions in the use of chloroflurocarbons and halons and establishes a framework for future action on the problem.

The City of Richmond is currently phasing out its use of refrigerants which contain CFC's and is planning on using non-CFC refrigerants in its cooling systems.

Recommendations
Adopt an energy policy statement, directed to the State and private sector, which includes the following elements:

1. Produce energy by methods which require minimal fossil fuel combustion, thereby minimizing contributions to acid rain and global warming.

2. Produce energy in conjunction with clean processes, using best available pollution control technology.

3. Emphasize the development and use of alternative non-fossil fuel based sources particularly nuclear power, solar, hydro, and wind.

4. Incorporate energy conservation measures to reduce costs and minimize air quality degradation.

5. Develop an economic development strategy which encourages businesses and industries which practice the above recommendations to locate within the City.

ENERGY CONSERVATION AND MANAGEMENT

OBJECTIVE
IMPLEMENT ENERGY CONSERVATION AND MANAGEMENT PRACTICES WITHIN CITY FACILITIES AND ENCOURAGE THEIR USE THROUGHOUT THE CITY OF RICHMOND.

Lighting, and its attendant air conditioning necessary to offset the heat generated from inefficient lights, comprises approximately 25% of the electricity used annually in the United States. Increasing the use of energy efficient lighting to include all areas where it is profitable represents an opportunity to reduce energy costs and environmental pollution simultaneously. The market now offers several dozen efficient lighting products which can provide similar quantity and quality of lighting while consuming a quarter of the electricity. When used to their fullest extent, consumers can save money and prevent the generation of millions of tons of carbon dioxide, and reduce sulfur dioxide and nitrous oxide emissions.

Not only lighting but virtually every energy consuming device used in buildings offers potential economic savings and reductions in pollution. Energy conservation can be achieved by investing in the most efficient furnaces, boilers, pumps, fans, refrigerators, air conditioners and natural cooling designs, motors and drive equipment, computers and peripherals, building design and materials, etc. By replacing the above items as they wear out with the best

available devices, efficiency gains can be achieved at a relatively modest cost.

Energy management techniques maximize the efficiency of equipment by adjusting the level of energy utilized according to various conditions. Examples include the installation of automated lighting controls that turn light off when a room is vacated, the use of economizer cycles which cycles the equipment off when it is not needed, and computerized controls on HVAC systems which sense and automatically adjust climate conditions.

Between the mid-1970's and the mid-1980's energy conservation and management investments were made which increased the nation's energy efficiency by 2.5%. According to the EPA, this increase achieved cost savings of more than $150 billion a year, reduced the need for 14 million barrels of oil equivalent per day, and reduced CO_2, SO_2, and NO_x emissions to 40% below what they would have been otherwise. Advances in technology continue to provide the means of achieving such reductions; however, more recently incentives for pursuing additional savings have been undermined in several ways:

- Traditionally, utilities have made money by building power plants and selling more kilowatt-hours. They suffer serious reductions in earnings when the encourage customers to reduce energy consumption through conservation techniques under the current regulatory scheme.

- State Corporation Commission (SCC) policies do not reward investments in energy conservation, therefore utilities have little incentive from the State to pursue conservation strategies of their own. Currently, the SCC is considering programs to encourage conservation programs by utilities.

- Developers typically construct inefficient buildings with inefficient fixtures and appliances in order to keep purchase costs down. As a result utilities invest half as much to increase capacity to the levels needed to accommodate inefficient buildings.

- Landlords who pass utility costs on to their tenants have no incentive to improve the efficiency of their facility, and tenants are reluctant to invest in property they do not own.

- Finally, the lack of information concerning the need for energy conservation, and the availability and reliability of cost effective efficiency measures keeps consumers and energy producers from investing in these options.

The EPA Green Lights Program is a program which encourages major corporations to install energy efficient lighting technologies wherever it is profitable. As a result, corporations are able to reduce energy consumption while maintaining or improving lighting quality. Green Lights is a voluntary, non-regulatory program which addresses the critical issues of energy efficiency, pollution prevention, and economic competitiveness. Corporations committing to the Green Lights program can benefit by reducing electric bills and improving lighting quality. In addition, corporations will contribute to the reduction of emissions caused by electricity generation: carbon dioxide, sulfur dioxide, and nitrogen oxides.

The Green Lights process includes a Memorandum of Understanding between the corporation and the EPA which commits the corporation to survey all of its facilities and install new lighting systems within five years of the agreement. The corporation also commits to build any new facilities with the most current energy efficient technology.

CAA Allowance Trading Program

The EPA is implementing a market-based allowance trading system as provided for in the CAA amendments which will provide utilities flexibility in reducing emissions. Under this system EPA will allocate allowances to affected utilities each year. Each allowance will permit the utility to release one ton of sulfur dioxide, and the utility may not emit more than it has allowances for. The program offers incentives to utilities which choose to reduce emissions through energy conservation measures or use of renewable energy. For every ton of SO_2 emissions reduced through these means, the utility will receive one free emissions allowance. In this manner, a utility attempting to meet its emissions allowance limit effectively "buys" two allowances for the price of one.

Utilities which reduce their emissions below the amount they have allowances for may elect to trade their allowances, bank them for future use, or sell them to other utilities for a profit. Beginning in the year 2000, the number of allowances EPA issues to utilities will be frozen at 8.9 million per year. EPA's role in allowance trading will be to receive and record allowance transfers and to ensure at the end of each year that a utility did not exceed its allowance limit.

Recommendations

A. Continue to incorporate innovative and effective energy management and conservation practices into City buildings and facilities for purposes of improving air quality and long term cost savings.

   1. Install energy saving lighting fixtures in City-owned buildings.

2. Promote the EPA "Green Lights" Program as a means for local corporations to increase energy efficiency and promote pollution prevention.

B. Revise existing (City) building code to encourage the use of economizer cycles, where not already required or employed, in renovation and new development projects.

C. Seek and support legislation for additional authority through the uniform state-wide building code.

D. Increase public awareness of the importance of energy management and conservation.

CLEAN INDOOR AIR

OBJECTIVE
DEVELOP APPROPRIATE METHODS TO ELIMINATE THE CAUSES OF SICK BUILDING SYNDROME IN CITY OWNED AND OPERATED FACILITIES AND TO IMPLEMENT THE VIRGINIA CLEAN INDOOR AIR ACT THROUGHOUT THE CITY.

Until recently, little thought was given to the fact that air inside a home, school, or office might be harmful to human health. Radon, asbestos, smoke, household chemicals, and chemicals typically found in furnishings all contribute to indoor air pollution.

In response to the public's increased energy consciousness and demand for energy efficiency in the 1970's, improvements were made in building design and construction. Buildings were tightly sealed because it is cheaper to recirculate air than to alternatively heat and cool air which is continuously brought in from the outside. As a result, employees or residents began to show similar symptoms of illness, a phenomenon called Tight Building Syndrome which began to be a problem in the mid-1970's.

Sick Building Syndrome
More recently experts began to realize that factors other than the sealed nature of buildings can be responsible for illnesses. Materials used to decorate and furnish the building can contain compounds which make a building's users ill. This phenomenon is called sick building syndrome, which like tight building syndrome causes workers or residents of a particular building to experience similar illnesses. The most common symptoms associated with sick building syndrome are lethargy, coughing, itchy or watery eyes, sore throat, dry skin, headaches, nausea, and general body aches.

The most common sick building syndrome pollutants and their sources include:

- Formaldehyde - found in upholstery, plywood, particle board, carpet, paneling, fiberglass, insulation, floor lacquer and varnish, and adhesives;
- Trichlorofluromethane - found in many refrigerant systems;
- Acetic Acid - found in tobacco smoke, solvents, caulks, and resins;
- Ethanol - found in fiberboard;
- Isopropanol - found in particleboard;
- Butylacetate - found in floor lacquers and adhesives;
- Hexane - found in gypsumboard and chipboard; and
- Benzene - found in adhesives and cleaners.

As the air is recirculated, these elements become more concentrated. Often, simply providing a supply of fresh air or installing an effective air filtration system will clear up sick building syndrome. Better housekeeping to minimize dust and reducing or eliminating smoking also will relieve sick building syndrome.

The City of Richmond has implemented steps to buy only formaldehyde-free furnishings for City facilities. Serious problems have occurred in the ventilation system of the Safety and Health Building caused by soot accumulating on electrostatic precipitators used to filter the air. It also has asbestos insulation present, remediation of which is estimated to cost at least $4.5 million.

Radon

Radon is a naturally occurring radioactive gas which comes from the breakdown of uranium, granite, shale, phosphate, and pitchblende (a type of mineral) in soils. It is odorless, tasteless, and invisible. Radon can also be found in soils contaminated with certain types of industrial wastes.

Radon becomes a problem when it accumulates in an enclosed space, such as a home. Indoor levels depend on both a building's construction and the concentration of radon in the underlying soils. Radon, being a gas, can enter a home in a variety of ways. It can seep into a home through dirt floors, cracks in concrete floors and walls, floor drains, sumps, joints, and small cracks or pores in hollow-block walls. Radon can also enter the water of private wells and is released when the water is pumped into the home. Radon is not usually associated with large, community water systems. In addition, homes with crawl spaces have a barrier between

the actual structure and the ground. Homes with in-ground basements have no such protection and are more at risk.

Radon is detected by equipment designed specially for this purpose and usually available at hardware stores. Homeowners can purchase two types of radon test kits: charcoal canisters (cost $10-$25) which are exposed to the air in the home for three to seven days and then sent to a laboratory for analysis; and alpha track detectors (cost $20-$50) which are exposed for two to four weeks and then sent to a laboratory for analysis.

The only known health effect associated with exposure to elevated levels of radon is an increased risk of lung cancer. It has been estimated that 5,000 to 20,000 lung cancer deaths per year may be attributed to radon exposure. In general, the risks associated with exposure increase as the level of exposure and length of exposure increase.

In Virginia, the area most likely to have radon contamination is the Piedmont region, roughly between the fall line and the eastern slopes of the Blue Ridge Mountains. Richmond is included in this area. The areas of highest concentration in the Richmond Metropolitan Area are in the western areas of the City and points west.

The City of Richmond faces no mandated responsibility in the area of radon detection or regulation; however, the City is in the process of conducting a survey of City owned facilities for the presence of radon. At this time there is no evidence of a radon problem in any of the surveyed facilities.

The Clean Indoor Air Act

In 1990 the Virginia General Assembly enacted the Clean Indoor Air Act which regulates smoking in public buildings. According to the Act, reasonable no smoking areas must be provided in any building owned or leased by the Commonwealth and any building owned or leased by a local government. Moreover smoking is prohibited in elevators, public school buses, common areas of any public school, hospital emergency rooms, local health departments, polling places, and indoor service or cashier lines. In addition restaurants having a seating capacity of 50 or more must provide no smoking areas sufficient to meet customer demand.

The Act delegates enforcement authority to the localities. Thus far the City has not passed an ordinance attempting to regulate smoking in public places; however, should the City decide to pass such an ordinance it must prohibit smoking the the areas identified in the Act, and may provide for regulation of smoking the following areas:

- retail establishments of 15,000 square feet or more;

- rooms in which public meetings are being held;
- places of entertainment;
- indoor recreation facilities; and
- other public places.

Areas where smoking may not be prohibited include: bars and lounge areas, retail tobacco stores, restaurants or other public places being used for private functions, office or work areas not generally open to the public, areas of shopping malls external to retail stores, and lobby areas of hotels and motels.

Recommendations

A. As chemicals contained in materials which compose buildings and furnishings are found to contribute to sick building syndrome, purchase only furnishings and materials which are free of these chemicals.

B. Develop a program by which systematic replacement or improvement of ventilation systems, products which contain asbestos, and other products which contribute to the problem is accomplished.

C. Enact an ordinance which regulates smoking in public places pursuant to the Virginia Clean Indoor Air Act which incorporates the following provisions.

1. The ordinance must be as stringent as the state legislation.
2. The ordinance may not prohibit smoking in certain areas.
3. The ordinance must require reasonable no smoking areas in any building owned or leased by the City of Richmond.
4. The ordinance must require that restaurants with a seating capacity of 50 people or more provide no smoking areas sufficient to meet customer demand. Consider requiring all restaurants to provide no smoking areas sufficient to meet customer demand.

D. Incorporate the prohibition of smoking in retail establishments greater than a certain size, rooms in which public meetings are being held, places of entertainment, indoor recreational facilities, and other public places into the City's ordinance.

E. Develop a mechanism for enforcement of smoking regulations in public buildings.

1. Increase permanent signage prominently displayed in non-smoking areas.

2. Develop a system of code enforcement for repeated offenses.

ELECTROMAGNETISM

OBJECTIVE
MONITOR THE ISSUE OF ELECTROMAGNETISM AS SCIENTIFIC DATA IS DEVELOPED TO DETERMINE IF PROLONGED EXPOSURE TO ELECTRIC OR MAGNETIC FIELDS, OR BOTH, REPRESENTS A SIGNIFICANT RISK TO PUBLIC HEALTH, SAFETY AND WELFARE.

The electric power that we use in our homes, offices, and factories utilizes alternating current (AC) power. An alternating current does not flow steadily in one direction, it flows back and forth at a rate of 60 times per second. This is called 60 hertz (Hz) power with which two kinds of fields are associated:

- electric fields - which result from the strength of the electrical charge; and

- magnetic fields - which result in the motion of the electrical charge.

Together, these are called electromagnetic fields. All currents produce electromagnetic fields.

The strength of an electric field depends on the voltage of the object creating it. A high voltage power line, for example, creates a stronger electric field than a low voltage line. An electric current does not have to be flowing through a line for an electric field to exist. Any electric appliance which is plugged in will create an electric field. Magnetic fields are created only when current is flowing: appliances which are plugged in but turned off do not produce magnetic fields.

Electric power is produced by large generating plants and then transferred to homes by way of high voltage transmission lines. There is an ongoing debate among scientists, the electric utility industry, and environmentalists concerning the health effects of these transmission lines.

Some epidemiological studies have been conducted and suggest that there may be an association between exposure to electromagnetic fields and an increase in leukemia in

children, in the growth rates of cancers, in the malformation of sperm, and in nervous system disorders in general. Other similar studies show no such association. Studies using laboratory animals have also been conducted. Some of the reported effects include a change in the production of various chemical messengers in the brain, changes in the rate at which DNA is made and replicated, and changes in the rate of growth of some cells. Again, similar studies have shown no such effects. A very real difference of opinion exists among scientists about what, if any, effects can be directly attributed to electromagnetic exposure.

The only verifiable effects that can be directly attributed to high voltage transmission lines are a decrease in milk production in cows who graze near the lines, and a decrease in honey production by hives situated near 60Hz lines. It is believed that cows and bees receive minute shocks which upset their ability to produce milk and honey.

The question which remains is what, if anything, can or should be done to regulate land use and development near high voltage transmission lines. It has been suggested that government regulations, if they are developed, should affect only new facilities and power lines. This is because even under the most pessimistic assumptions it is hard to justify the costs of modifying old facilities and lines. These costs would have to be passed on to the consumers, who may not wish to pay higher rates for new lines that may not be needed.

Given the level of ambiguity and uncertainty surrounding electromagnetic fields, many regulatory authorities have been advocating a "prudent avoidance" approach. This approach recognizes that the available literature neither provides a basis for asserting that electromagnetic fields constitute a significant risk, nor that they represent no risk whatsoever. Following this lead, in 1990 New York adopted an interim standard limiting magnetic field strength near electric power transmission facilities. The New York standard was based upon a survey of existing magnetic fields near the transmission circuits. The New York Public Service Commission concluded that rather than adopt unnecessary strict standards, the better approach was one of avoiding unnecessary increases in existing levels of exposure to electromagnetic fields.

In the City of Richmond, the City Planning Commission must review and approve the encroachment of private transmission lines over public rights of way (see figure). The City therefore could influence the location of future power transmission lines if it were to be determined that electromagnetic exposure is a verifiable threat to the public health.

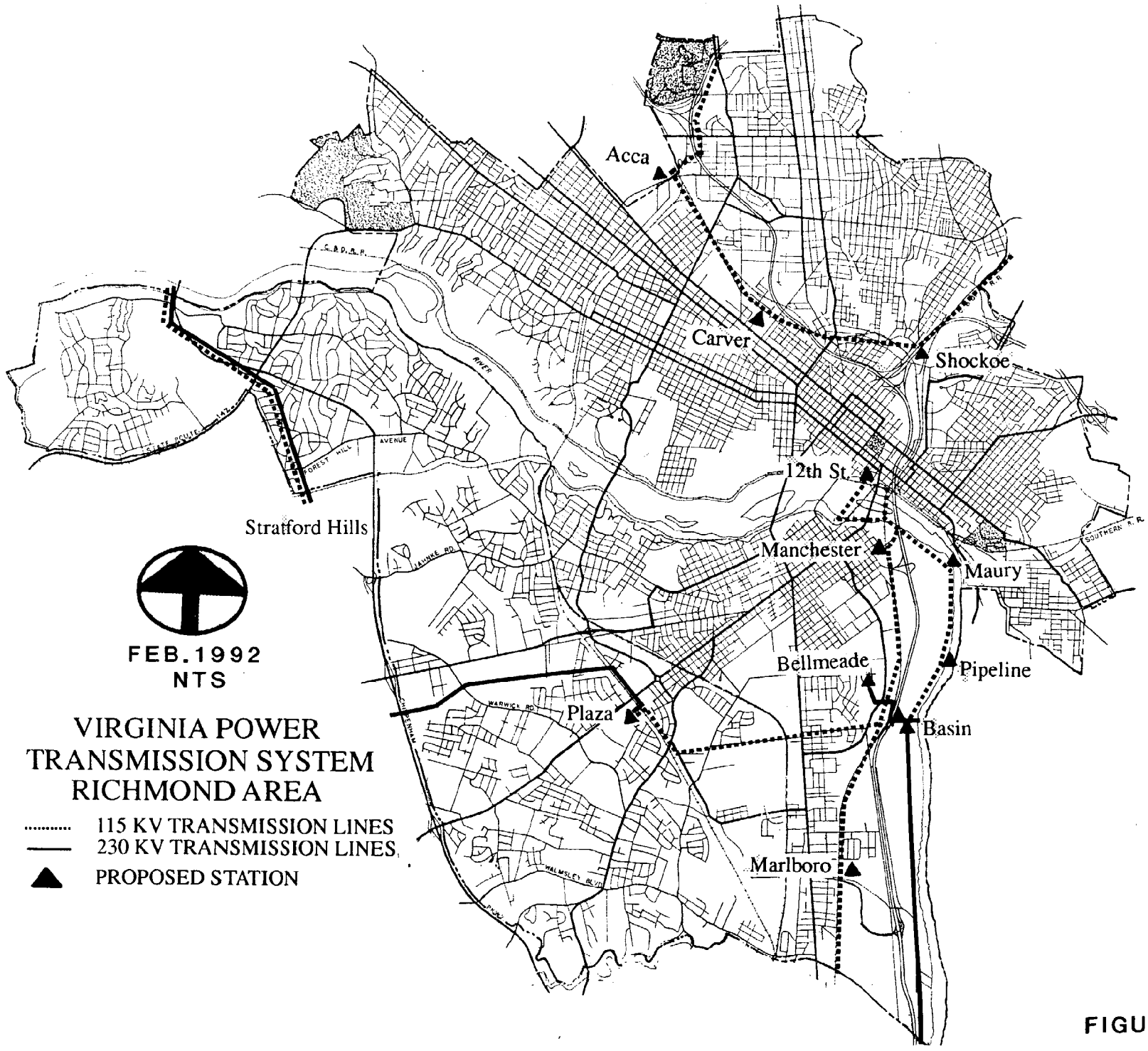

Acca
Carver
Shockoe
12th St.
Stratford Hills
Manchester
Maury
Bellmeade
Pipeline
Plaza
Basin
Marlboro
FEB. 1992
NTS
VIRGINIA POWER
TRANSMISSION SYSTEM
RICHMOND AREA
115 KV TRANSMISSION LINES
230 KV TRANSMISSION LINES
PROPOSED STATION

FIGURE _____

Recommendations

A. In the present absence of conclusive data regarding the risks of exposure, adopt a policy of "prudent avoidance."

   1. Complete a survey of the average magnetic field at the edges of the rights of way for all existing 115 and 230 kilovolt transmission circuits located within the City limits.

   2. Set an interim standard limiting magnetic field strength near electric power transmission facilities proposed within the City limits based upon the existing situation as determined by the survey.

B. Seek and support legislation containing a statewide interim standard limiting magnetic field strength near electric power transmission facilities.

C. Develop a public education campaign to raise awareness of the issue of electromagnetism and keep the public informed of developments in the field.

AIR QUALITY AND ECONOMIC DEVELOPMENT

OBJECTIVE

ADOPT AN ECONOMIC DEVELOPMENT STRATEGY WHICH CAPITALIZES ON THE ADVANTAGES OF A CLEANER CITY WHILE MINIMIZING THE DISADVANTAGES OF BEING DESIGNATED A NONATTAINMENT AREA BY THE CLEAN AIR ACT.

Richmond is an old city where the original industrial economic base has shifted in recent decades toward a professional, business and service industry orientation. Federal and State efforts to protect and improve the environment through various regulatory measures affect the operations of business and industry. Not only is the City responsible for implementing many of these mandated programs, but this document recommends that the City go beyond minimum requirements for the purpose of improving the quality of life for Richmond's citizens. During the implementation of these recommended plans and programs, it is imperative that the City maintain a balance between the environment as an important component of Richmond's character and economic viability.

Environmental quality can both contribute to and detract from quality of life in a city such as Richmond. Pollution resulting from careless operation of industries and businesses burdens the land with both environmental degradation and legal snarls, making it very difficult for subsequent owners to develop the contaminated property.

Carelessness on neighboring properties can result in contamination which respects neither property nor jurisdictional boundaries leaving innocent landowners with unwarranted responsibilities. Federal mandates strive to improve environmental quality yet their requirements can translate into astronomical compliance costs for business and industry.

Within the array of environmental legislation, this phenomenon is most apparent in the Clean Air Act. As discussed in the following section, the potential impacts of the CAA on economic development on the City are troublesome. For example, the act requires an off-set ratio of total emission reductions of VOCs to total increased emissions of VOCs from a proposed new point source be at least 1.15:1. This means that new sources must provide a corresponding reduction in emissions which is most easily obtained by closing down an existing source. Another option is for the new source applicant to introduce pollution control technology to the existing source in order to reduce emissions rather than close it down which can be a very expensive proposition.

Other requirements of the CAA which represent potential economic impacts in the City include the Stage II vapor recovery systems and the Inspection and Maintenance (I/M) program. Installation of Stage II vapor recovery systems is required by all new or existing gasoline dispensing facilities with a throughput of 10,000 gallons per month or more. Stage II vapor recovery systems are systems placed on service station gasoline pumps to control and capture gasoline vapors during automobile refueling. The I/M program will require periodic inspections of vehicle exhaust systems to ensure that emissions of specified pollutants are not exceeding established limitations.

A program similar to this has been in place in northern Virginia for several years and for the consumer represents little more than an inconvenience; however, depending upon the manner in which the State chooses to implement the program, it may mean a substantial capital outlay for privately owned inspection stations. There are two basic means of implementing the program: development of a state operated, centralized system of inspection stations versus the use of existing, privately operated inspection stations. If the State chooses the latter approach, privately owned stations will be required to purchase the equipment and invest in employee training as necessary for the testing of vehicle exhaust systems.

This element recommends that the City consider the impact of environmental legislation, particularly the CAA, on its economic development policies. A balance can be found between environmental quality and economic development.

Adjustments must be made which encourage business expansion and retention within today's regulatory climate by emphasizing the strides being made in environmental quality and the resulting positive impact on the desirability of the City as a place to live, work, and visit.

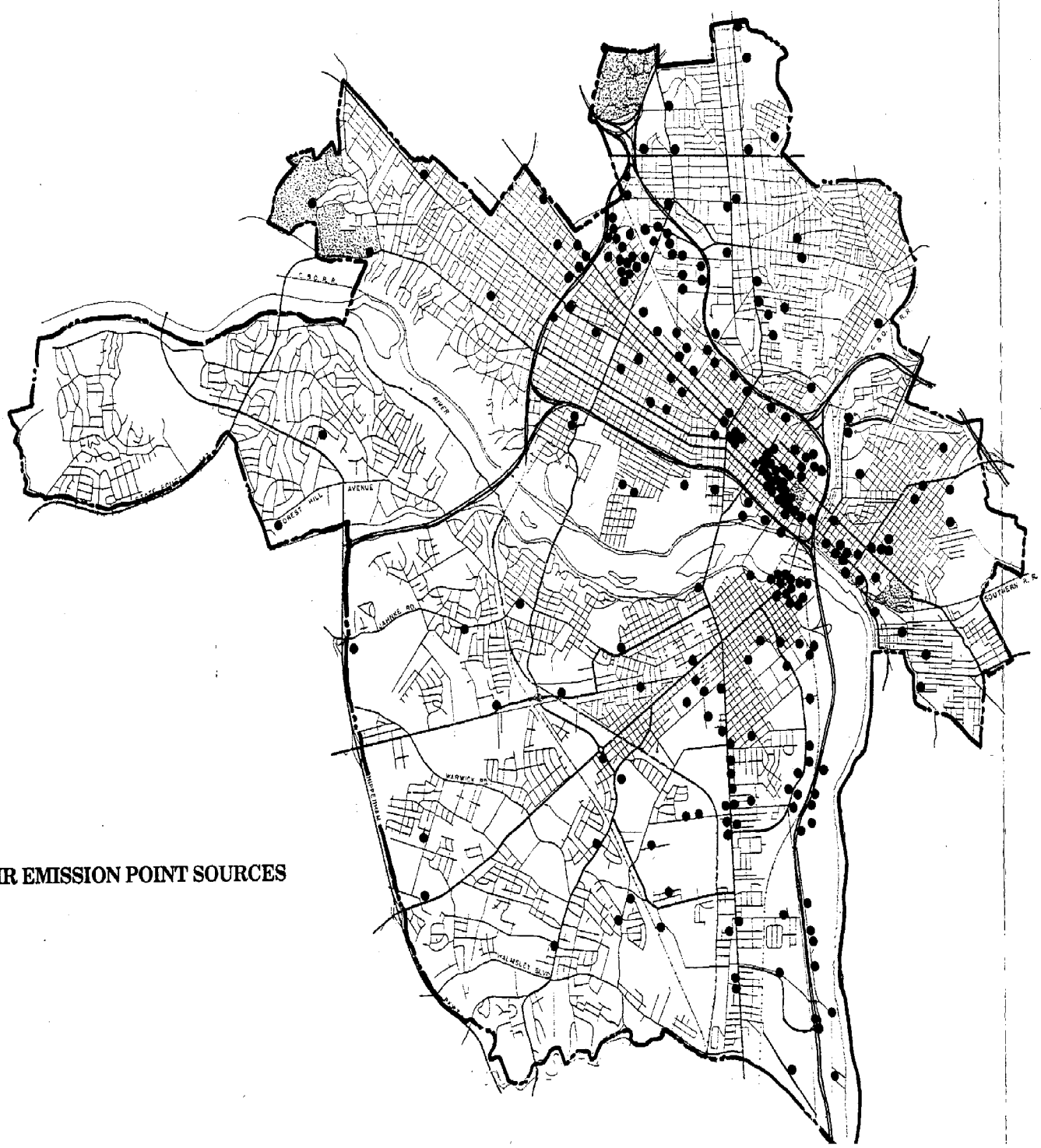
Air Pollution Point Sources

The CAA categorizes point sources as major and non-major. A major point source has the potential to produce 100 tons per year (TPY) of volatile organic compounds (VOCs) in a moderate nonattainment area, such as Richmond. Non-major sources are sources which do not meet these emission limits. Small businesses and industries, as well as institutional facilities, make up the bulk of the non-major sources. According to the Virginia Department of Air Pollution Control, there are a total of 284 point sources located within the City of Richmond (see figure).

From a land use perspective, point sources present a complex problem. The City can only regulate the placement of plants or structures which have the potential to emit air pollution through the zoning ordinance. If a structure meets the land use requirements of the district in which it is to be built (M-1 Light Industrial or M-2 Heavy Industrial), and does not pose a threat as a public nuisance, the City has limited authority to further regulate the structure. This remains the case if a structure is built on a lot zoned for industrial use but which is adjacent to a lot or district which is zoned for residential use. The Department of Air Pollution Control does computer modelling of emission levels during the permitting process, requiring that new or modified sources do not pose a human health hazard at the "fence line." The rationale being that air emissions become less of a concern the farther away from the source you are located.

Air pollution point sources also pose a dilemma in that they can become part of an "off-set" arrangement. Off-sets are required by the Clean Air Act amendments (CAA) at a ratio of 1.15:1 in moderate nonattainment areas. This means that older plants which have the potential to emit more pollution can be purchased and closed by the developer of a newer, cleaner operating plant. In this manner the new source has not added to the net amount of pollution in the area.

Off-sets may impact economic development within the City of Richmond if the preferred sites for new facilities are located in neighboring counties while older emitters are bought and shut down within the City in order to satisfy offset requirements. The types of facilities which are most commonly purchased for off-sets are printing and fuel storage facilities. In some states industry is buying up smaller generators including dry cleaning establishments, individual gas stations, and even cars without catalytic converters in anticipation of future offset requirements.



• AIR EMISSION POINT SOURCES

FEB. 1992

NTS

LOCATIONS OF AIR EMISSION POINT SOURCES

NAME	ADDRESS
REYNOLDS METALS	7TH AND BAINBRIDGE
SAMPSON COATINGS	301 HULL STREET
SONOCO PRODUCTS	1850 COMMERCE ROAD
MILLER MFG.	512 STOCKTON STREET
PHILLIP MORRIS, USA	2325 MAURY STREET
AMERICAN TOBACCO	410 W. FRANKLIN
MANCHESTER BOARD	111 HULL STREET
MCV	1000 E. CLAY STREET
POHLIG BROS.	2418 E. FRANKLIN
RICHMOND LUMBER	4TH AND MAURY
OK FOUNDRY	1005 COMMERCE ROAD
BRISTOL STEEL	4TH AND GORDON
CAPITOL PRINTING INK	3118 W. LEIGH
WESTVACO	2300 JEFFERSON DAVIS HWY.
AMERICAN TOBACCO	400 JEFFERSON DAVIS HWY.
RICHMOND NEWSPAPERS	333 E. GRACE ST.
TRUXMORE, INC.	6TH & DINWIDDIE
A. H. ROBINS	1407 CUMMINGS DRIVE
JOHN MARSHALL HOTEL	5TH AND FRANKLIN
MILLHISER INC.	1125 COMMERCE ROAD
WM. BYRD HOTEL	2501 W. BROAD
APAC-VIRGINIA	1405 ROSENEATH ROAD
INTERSTATE CONST.	2100 DEEPWATER TERMINAL RD.
AURAND MFG.	2801 DECATUR STREET
MCGUIRE HOSPITAL	1201 BROAD ROCK
UNION CAMP	2801 COFER ROAD
CRAWFORD MFG.	3RD AND DECATUR STREET
C. F. SAUER	2000 W. BROAD STREET
FIRST ENERGY	2ND AND MAURY STREET
FIRESTONE TIRE	3028 HOPKINS ROAD
AMERICAN TOBACCO	26TH AND GRACE STREET
PHILLIP MORRIS	1915 E. MAIN STREET
PHILLIP MORRIS	2303 BELLS ROAD
PHILLIP MORRIS	2301 EVERETT STREET
PHILLIP MORRIS	7TH AND STOCKTON STREET
DIXIE CONTAINER	2000 JEFFERSON DAVIS HWY.
GOODWILL INDUSTRIES	2520 E. BROAD STREET
RICHMOND COCA-COLA	1310 ROSENEATH ROAD
J. M. FRY CO.	830 HULL STREET
M&B HEADWEAR	2323 E. MAIN STREET
TIDEWATER MATERIALS	2100 DEEPWATER TERMINAL RD.
HOERNER WALDOFF CORP.	1500 JEFFERSON DAVIS HWY.
VCU-WEST CAMPUS	821 W. FRANKLIN STREET
CONOCO, INC.	204 E. 1ST STREET
UNION ENVELOPE	1607 SHERWOOD/HERMITAGE RD.
U.S. TOBACCO	1100 JEFFERSON DAVIS HWY.
MILLER MORTON, CO.	2907 N. HAMILTON STREET
REYNOLDS METALS	1601 SHERWOOD AVENUE
CHEVRON, U.S.A.	700 GOODES STREET
TUCERSHARPE PEN CO.	3806 JEFFERSON DAVIS HWY.
STICKLAND FOUNDRY	2332 E. MAIN STREET
INTERBAKE FOOD CO.	900 TERMINAL PLACE
SAMPSON COATINGS, INC.	1900 ELLEN ROAD
UNIV. OF RICHMOND	THREE CHOPT/RIVER ROADS
R. A. SIEWERS	1901 ELLEN ROAD
MASSY, WOOD & WEST	912 HERMITAGE ROAD
SOUTHERN STATES	1ST AND HULL STREETS
TARMAC-LONESTAR	HOPKINS ROAD
PHILLIP MORRIS U.S.A.	1915 E. MAIN STREET
MOORE KELLY TIRES	2400 CHAMBERLAYNE AVE.
EXXON USA	2000 TRENTON AVENUE
CONCRETE PIPE	1207 SCHOOL STREET
SHOW CASE WOODWORK.	2823 E. MAIN STREET
CONCRETE PIPE	2900 TERMINAL AVE.
GREEN OIL CORP.	1708 MAGNOLIA STREET
RICHMOND TIRE	1806 JEFFERSON DAVIS HWY.
JAMES RIVER CORP.	TREDEGAR ST.
UNION OIL OF CAL.	GOODE/COMMERCE STREETS
SOUTHERN STATES	HULL/MANCHESTER ROAD
AMOCO OIL	COMMERCE ROAD/I-95
ITT CONTINENTAL BKING.	10 S. JEFFERSON STREET
FIRST NAT'L BANK BLDNG.	823 E. MAIN STREET

NAME	ADDRESS
HUGUENOT HIGH SCHOOL	7945 FOREST HILL AVENUE
ALBERT HILL MIDDLE	3400 PATTERSON AVENUE
S. HAMPTON ELEM.	3333 CHEVERLY ROAD
J. E. B. STUART ELEM.	3010 FENDALL AVENUE
SUMMER HILL SCHOOL	2717 ALEXANDRIA STREET
MAGGIE WALKER BLDNG.	1000 N. LOMBARDY STREET
RICHMOND SCHL. WRHSE.	2907 N. BOULEVARD
WESTHAMPTON SPEC. ED.	5800 PATTERSON AVENUE
WESTOVER HILLS MID.	1211 JAHNKE ROAD
WHITCOMB COURT ELEM.	2100 SUSSEX STREET
WOODVILLE ELEM. SCHL.	2000 N. 28TH STREET
GEORGE WYTHE HIGH	4314 CRUTCHFIELD STREET
INLAND CONTAINER CORP.	2320 DEEPWATER TERMINAL RD.
RICH LINE MFG.	2121 W. HAMILTON STREET
MATTHEWS TIRE SALES	2307 HULL STREET
E. M. TODD CO.	HERMITAGE/LEIGH STREETS
E. R. CARPENTER CO.	2400 JEFFERSON DAVIS HWY.
KOCH FUELS	4110 DEEPWATER TERMINAL RD.
EASTERN SLEEP PRDCTS.	3200 WILLIAMSBURG ROAD
AMF INC.	2115 W. LABURNUM AVENUE
UPACO ADHESIVES INC.	4105 CASTLEWOOD ROAD
KENSINGTON GARDENS	2900 KENSINGTON AVENUE
THALHIMER BROS. INC.	7TH AND GRACE STREETS
THALHIMER BROS. INC.	200 WESTMORELAND STREET
REYNOLDS METALS CO.	5TH AND CARY STREETS
FEDERAL BUILDING	N. 8TH STREET
U. S. COURTHOUSE	10TH AND MAIN STREETS
BERKSHIRE APARTMENTS	300 W. FRANKLIN STREETS
CHRENSHAW/SINGLETON	311 W. FRANKLIN STREET
FIDELITY BANKSHARES	830 E. MAIN STREET
MAIN STREET ASSOC.	1001 E. MAIN STREET
LEE MEDICAL BUILDING	1805 MONUMENT AVENUE
ESKIMO PIE CORP.	530 E. MAIN STREET
VA. FARM BUREAU	200 W. GRACE STREET
GENERAL ASSEMBLY BLDG.	910 CAPITOL STREET
RICHMOND COLISEUM	5TH AND 7TH STREETS
TUCKAHOE APTS.	5621 CARY STREET
MUTUAL BLDNG.	909 E. MAIN STREET
IMPERIAL PLAZA CORP.	1717 BELLEVUE AVENUE
MONROE PRESTWOULD	612 W. FRANKLIN STREET
SOMMA AND CO.	700 E. MAIN STREET
MEDICAL ARTS BLDNG.	2ND AND FRANKLIN STREETS
CENTRAL NAT'L BANK	EAST BROAD STREEET
CITY SAFETY BLDNG.	N. 9TH STREET
CITY JAIL	1701 FAIRFIELD AVENUE
CITY HALL	900 E. BROAD STREET
THE MOSQUE	LAUREL AND MAIN STREETS
CITY LIBRARY	101 E. FRANKLIN STREET
HOME BENEFICIAL INS.	3901 E. BROAD STREET
RIVER TOWER ASSOC.	2000 RIVERSIDE DRIVE
SEABOARD COSTLINE	3600 W. BROAD STREET
7TH AND FRANKLIN PRT.	701 E. FRANKLIN STREET
HOTEL JEFFERSON	MAIN AND JEFFERSON STS.
PEATROSS MFG.	2511 N. LOMBARDY STREETS
CROWN CENTRAL PETRO.	NICHOLSON AND MAIN STREETS
CHARLES ZOPPA INC.	22 S. 22ND STREETS
BECKSTOFFER SONS INC.	1209 N. 28TH STREET
PHILLIP MORRIS U.S.A.	3601 COMMERCE ROAD
SIEGELS SUPERMKT.	1911 W. MAIN STREET
ALLEN INDUSTRIES	3310 DEEPWATER TERMINAL RD.
LITTLE OIL CO.	1638 COMMERCE ROAD
LOWES THEATER CORP.	6TH AND GRACE STREET
RICHMOND MEM. HSPTL.	1300 WESTWOOD AVENUE
CHIPPENHAM MED. CNTR.	7101 JAHNKE ROAD
S&W CAFETERIA	4644 N. SOUTHSIDE PLAZA
F & M PROPERTIES	1111 E. MAIN STREET
RICHMOND EYE & EAR	408 N. 12TH STREET
VIRGINIA UNION UNIV.	1500 N. LOMBARY ST.
CITY RICHMOND JUD.	900 MARSHALL STREET
UNION THEOLOGIC SEM.	3401 BROOK ROAD

NAME	ADDRESS
C&O RAILWAY	1528 E. MAIN STREET
CURLES NECK DAIRY	1600 ROSENEATH ROAD
GEORGE H. MEYER	1601 OVERBROOK ROAD
SUN CHEMICAL CORP.	3435 W. LEIGH STREET
REYNOLDS METALS	11TH AND BYRD STREETS
CONSOLIDATED CIGAR	600 PERDUE AVENUE
CITGO PETROLEUM	3RD AND MAURY STREETS
WESTVACO	2828 COFER ROAD
LOUNGE-WEAR INC.	3210 W. LEIGH STREETS
REDFORD BRICK CO.	12TH & MAURY STREET
WESTVACO	320 HULL STREET
NAPPE-BABCOCK	1500 COMMERCE ROAD
BAKER EQUIP. ENGINEERS	SUMMIT AND NORFOLK STRTS.
EXPERT GRAPHICS	2015 W. LABURNUM AVE.
DELUXE CHECK PRINTERS	3405 COMMERCE ROAD
TARMAC-LONESTAR	3011 DOCK STREET
HYMAN VIENER & SON	5500 HATCHER STREETS
HUNGERFORD COAL	16TH AND BROWN STREETS
TIDEWATER CRSH STONE	2100 TERMINAL ROAD
GREAT A&P TEAD CO.	1704 JEFFERSON DAVIS HWY.
CHILDREN'S HOSPITAL	2924 BROOK ROAD
SERVICE TIRE	1301 JEFFERSON DAVIS HWY.
JAMES RIVER CORP.	4700 DEEPWATER TERMINAL
STUART CIRCLE HOSP.	413 STUART CIRCLE
THIRTEEN ACRES SCHOOL	3801 HERMITAGE ROAD
RUFFIN ROAD ELEM.	RUFFIN ROAD
RICHMOND CITY OIC	21 E. LEIGH STREET
RICHMOND TECH. CNTR	2020 WESTWOOD AVENUE
G. H. REID ELEM.	1301 WHITEHEAD ROAD
ELIZABETH REDD ELEM.	5601 JAHNKE ROAD
RANDOLPH SCHOOL	300 S. RANDOLPH
OAK GROVE SCHOOL	E. 18TH STREET
OAK GROVE/BELLEMEADE	2200 INGRAM STREET
GINTER PARK ANNEX	4011 MOSS SIDE AVENUE
NORRELL SCH. ANNEX	201 GRAHAM ROAD
NORRELL ELEM.	2120 FENDALL STREET
MARY MUNFORD SCHL.	211 WESTMORELAND STREET
MOSBY MIDDLE SCHOOL	1000 MOSBY STREET
MAYMONT ELEMENTARY	1211 S. ALLEN AVENUE
GEORGE MASON ELEM.	813 N. 28TH STREET
JOHN MARSHALL HIGH	4225 OLD BROOK ROAD
ROBERT E. LEE ELEM.	3101 KENSINGTON AVENUE
J. F. KENNEDY HIGH	2300 COOL LANE
THOMAS JEFFERSON HIGH	4100 GRACE STREET
CARY SCHOOL ANNEX	700 BLANTON AVENUE
E. S. H. GREENE ELEM.	1745 CATALINA DRIVE
GRAVES MIDDLE SCHL.	119 W. LEIGH STREET
GINTER PARK SCHOOL	3817 CHAMBERLAYNE AVENUE
ROBERT FULTON SCHOOL	1000 CARLISLE AVENUE
SWANSBORO ELEM.	3160 MIDLOTHIAN TRNPK.
WILLIAM FOX ELEM.	2300 HANOVER AVENUE
CLARK SPRINGS ELEM.	1101 DANCE STREET
CHIMBORAZO ELEM.	3000 E. MARSHALL STREET
FAIRFIELD COURT	2510 PHAUP STREET
ELKHARDT MIDDLE SCHL.	6300 HULL STREET
EAST END MIDDLE SCHL.	701 N. 37TH STREET
OLD CHIMBORAZO ELEM.	3000 E. MARSHALL STREET
CHANDLER ELEM. SCHOOL	E. BROOKLAND PARK BLVD.
CARY ELEM. SCHOOL	3021 MAPLEWOOD AVENUE
GEO. CARVER ELEM.	1109 W. LEIGH SCHOOL
REAL SCHOOL	4929 CHAMBERLAYNE AVENUE
BROAD ROCK ELEM.	4615 FERGUSON LANE
BLACKWELL ELEM.	1600 EVERETT STREET
ARMSTRONG HIGH	1631 N. 31ST STREET
BINFORD MIDDLE	1701 FLOYD AVENUE
GRACE ARENTS SCHOOL	600 S. PINE STREET
AMELIA SPEC. ED. SCHOOL	1821 AMELIA STREET
HICKORY HILL SPEC. ED.	3000 BELT BOULEVARD
PATRICK HENRY ELEM.	3411 SEMMES AVENUE

NAME	ADDRESS
KRAFT DAIRY, INC.	3031 NORFOLD STREET
STANDARD BRIG CO.	102 E. BROAD STREET
RICHFOOD INC.	1505 ROBIN HOOD ROAD
SEVEN-UP BOTTLING	1800 SUMMIT AVENUE
RETREAT HOSPITAL	2621 GROVE AVENUE
SOUTHERN STATES COOP	2800 DURHAM STREET
F. H. NOTT CO.	900 BROOK ROAD
GILMOUR COURT APTS.	305 N. THOMPSON STREET
VIRGINIA HOSP. LAUNDRY	1601 N. 17TH STREET
RICHMOND GRAVURE INC.	3400 DEEPWATER TERMINAL RD.
REYNOLDS METALS	4TH AND CANAL STREETS
THIELE-ENGDAHL INC.	3411 SHAW LANE
VA. DIV. OF MOTOR VEH.	2220 W. BROAD STREET
14TH STREET OFFICE BLD.	14TH AND FRANKLIN STREETS
ELECTRICAL EQUIP. CO.	1807 N. BOULEVARD
FOREIGN MISSION BOARD	3806 MONUMENT AVENUE
EASTERN ELECTRICAL	1001 E. 4TH STREET
RICHMOND METRO. HOSP.	700 E. GRACE STREET
SATTERWHITE PRINTING	3413 CARLTON STREET
CREATIVE SCREEN PRNTG.	3431 W. LEIGH STREET
RICHMOND COMM. HOSP.	1500 N. 28TH STREET
PHYSICIANS CLIN. LAB	1514 RHOADMILLER ROAD
PHILLIP MORRIS U.S.A.	4200 DEEPWATER TERMINAL RD.
ROSS ASSOCIATES	801 E. MAIN STREET
STANDARD PARTS	500 COMMERCE ROAD
J. L. CULPEPER	ROSENEATH ROAD
CRANE TIRE CO.	MOORE STREET
REHRIG INT'L	LEIGH AND BOWE STREETS
J. SARG. REYNOLDS C.C.	700 JACKSON STREET
NELSON ELECTRICAL	1010 HOLLY SPRING AVENUE
OVERNITE TRANSPORT.	1000 SEMMES AVENUE
PLANTATION HOUSE	2108 E. MAIN STREET
ARTHUR ASHE CENTER	3001 N. BOULEVARD
AMERICAN INKS	111 AGENCY AVENUE
RICHMOND BARREL CO.	1705 E. COMMERCE ROAD
SMITH IRON AND METAL	2 MILES WEST OF I-95
WESTVACO CO.	3001 COFER ROAD
SHOCKOE HILL ELDERLY	2ND AND HOSPITAL STREETS
TARMAC MID-ATLANTIC	1700 DEEPWATER TERMINAL RD.
UNIVERSAL LEAF TOBAC.	HAMILTON AND BROAD STREETS
SHERMAN CONCRETE	901 E. BYRD STREET
RICHMOND POWER ENT.	1660 COMMERCE ROAD

Recommendations

A. Incorporate air quality considerations into existing and future economic development plans and strategies.

   1. Recognize and prepare for the potential impact of offsets on the economic base of the City of Richmond.

   2. Recognize the implications of business and development restrictions applicable within nonattainment areas, including:

      - Stage II vapor controls; and

      - Implementation of required I/M programs which impose additional cost and inconvenience to residents and businesses with pool vehicles.

B. Incorporate air quality considerations into the overall economic development program and planning efforts including:

   1. Recognition of the interrelationship between improved mass transit systems, clean air, land use, and economic development; and

   2. recognition of the interrelationship between air quality and quality of life.

C. Track nonattainment status and develop programs and policies aimed at achieving attainment in conjunction with state efforts.

D. Monitor scientific data regarding alternative energy sources as it is developed in pursuit of compliance with Clean Air Act amendments by businesses located within the City.

E. Evaluate compliance of Department of Air Pollution Control permit applicants with local ordinances, including the impacts of proposed emissions.

F. Monitor emergence of scientific data on air toxics and other non-criteria pollutants as it is developed; and implement land use policy as necessary to protect the health, safety, and welfare of citizens.

NOISE

Chapter 7

INTRODUCTION

Noise levels increase with city size and density. In urban areas noise is generated by a variety of sources including heavy traffic, airports, railroads, construction and demolition projects, and industrial land uses. Noise has only recently been recognized as an environmental problem affecting people other than workers exposed to high noise levels on a daily basis. Typically, noise has been treated as a public nuisance by governmental regulations, making enforcement difficult.

Noise is defined as intrusive, unwanted sound. Certain noises bother or annoy people at different times, during different circumstances. For instance, people are more likely to experience annoyance from excessive noise during evening hours, especially in residential areas. Noise is measured in decibels. A soft whisper has a sound level of 30 decibels, ordinary conversation is 60 decibels, a shout is 80 decibels. Automobile traffic ranges from 50 to 90 decibels, a subway train from 90 to 100 decibels, and a jet airplane at 2000 feet is about 120 decibels.

Noise has many adverse effects including hearing damage, disruption of normal activity, and general annoyance. The physical threshold for noise-induced pain is 120 to 140 decibels. Prolonged exposure to levels above 80 to 90 decibels can cause permanent hearing damage.

Sound generated by departing and approaching aircraft is one of the most difficult urban noise problems. In an effort to help control the problem of aircraft and airport noise, the Federal Aviation Act was amended in 1968 to require the Federal Aviation Administration to develop and enforce noise standards for aircraft engines. As new engines have been designed and placed into operation, the amount of noise generated has decreased considerably. At the local level, attempts at controlling aircraft and airport noise have centered on regulating adjacent land uses. The policy of the FAA, which has been upheld by the courts, is to leave to the localities the responsibility for control of airport noise through land use restrictions on incompatible uses, site location, airport design, ground procedures, and restrictions on airport use.

GOAL

ENSURE A SAFE AND HEALTHFUL ENVIRONMENT THROUGH THE MODERATION OF UNREASONABLE NOISE AND THE REDUCTION OF NOISE IMPACTS IN THE CITY OF RICHMOND.

AIRCRAFT AND AIRPORT NOISE

OBJECTIVE

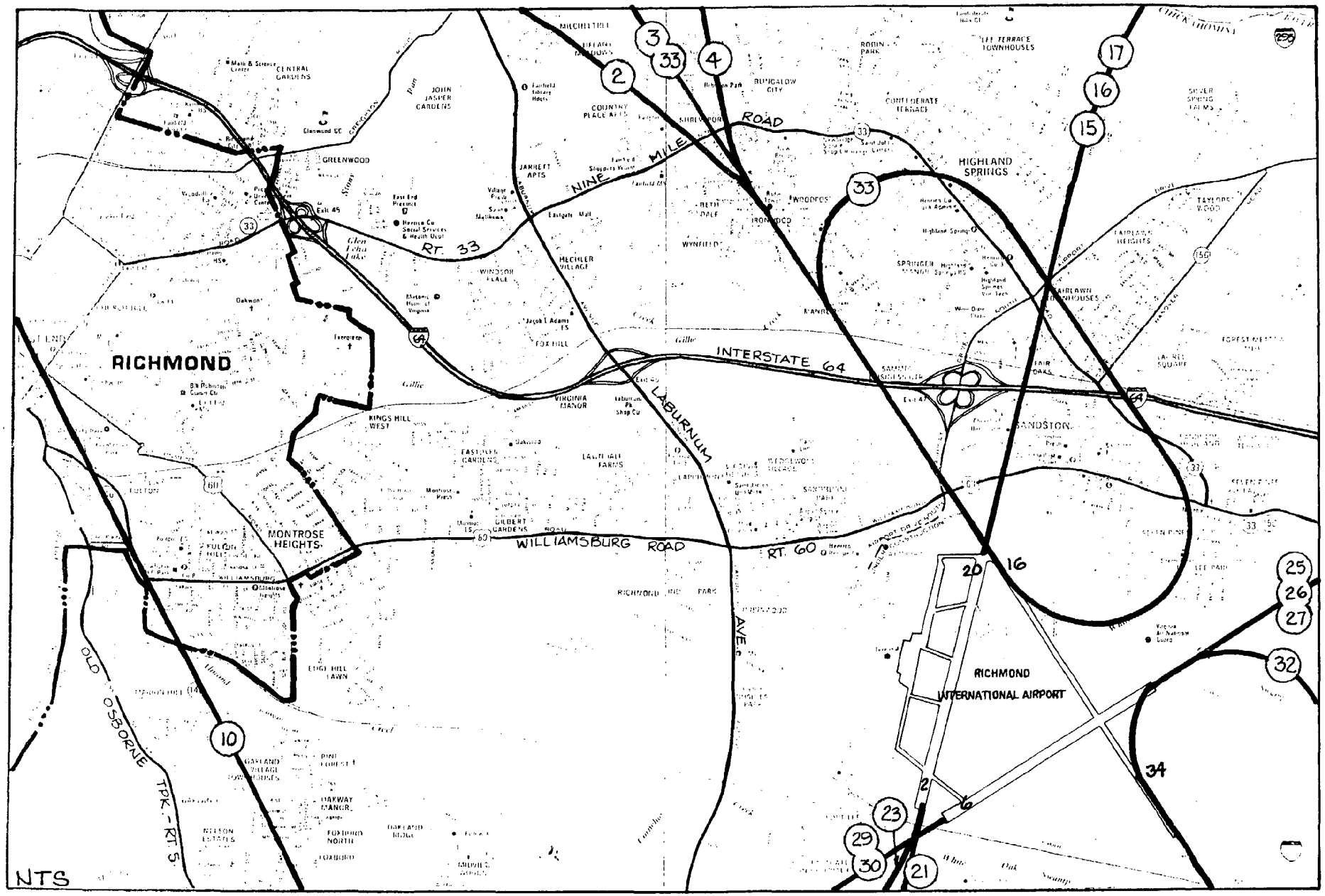
ENSURE THAT ALL NECESSARY STEPS ARE TAKEN TO MITIGATE THE IMPACTS OF AIRPORT AND AIRCRAFT NOISE ON RESIDENTIAL AND OTHER NOISE SENSITIVE LAND USES IN THE CITY.

Airport noise is measured in contours of equal noise exposure using the Day/Night Average Sound Level (Ldn) noise metric. These measurements are cumulative and are compiled over a 24-hour period. According to the FAA, an Ldn of 65 to 75 is considered significant exposure and is "normally unacceptable." An Ldn of 75 or higher is "clearly unacceptable" as it is considered to be severe noise exposure. In areas of severe exposure most land uses including residential, service industries, and cultural activities are not recommended. Most of the land uses in the noise-sensitive areas adjacent to the Richmond International Airport are industrial and agricultural. According to a 1981 study of existing and future off-airport noise impacts, 4,340 housing units were found to be within the 65 Ldn contour. All of these homes are in Henrico County. The 65 Ldn contour of Richmond International Airport does not reach into the City of Richmond (see figure).

According to a study completed in 1981, roughly 145,000 arrivals and departures occur each year at Richmond International Airport. These arrivals and departures primarily use Runways 2, 16, 20 and 34, with Runways 2 and 34 being the runways which most directly impact City residents.

Noise Abatement Procedures have been developed by the FAA Richmond Tower in an effort to lessen the impact of airport operations. These procedures are followed at the aircraft pilot's option. Pilot runway requests that are contrary to abatement procedures are honored, although such requests are discouraged. The Noise Abatement Procedures include:

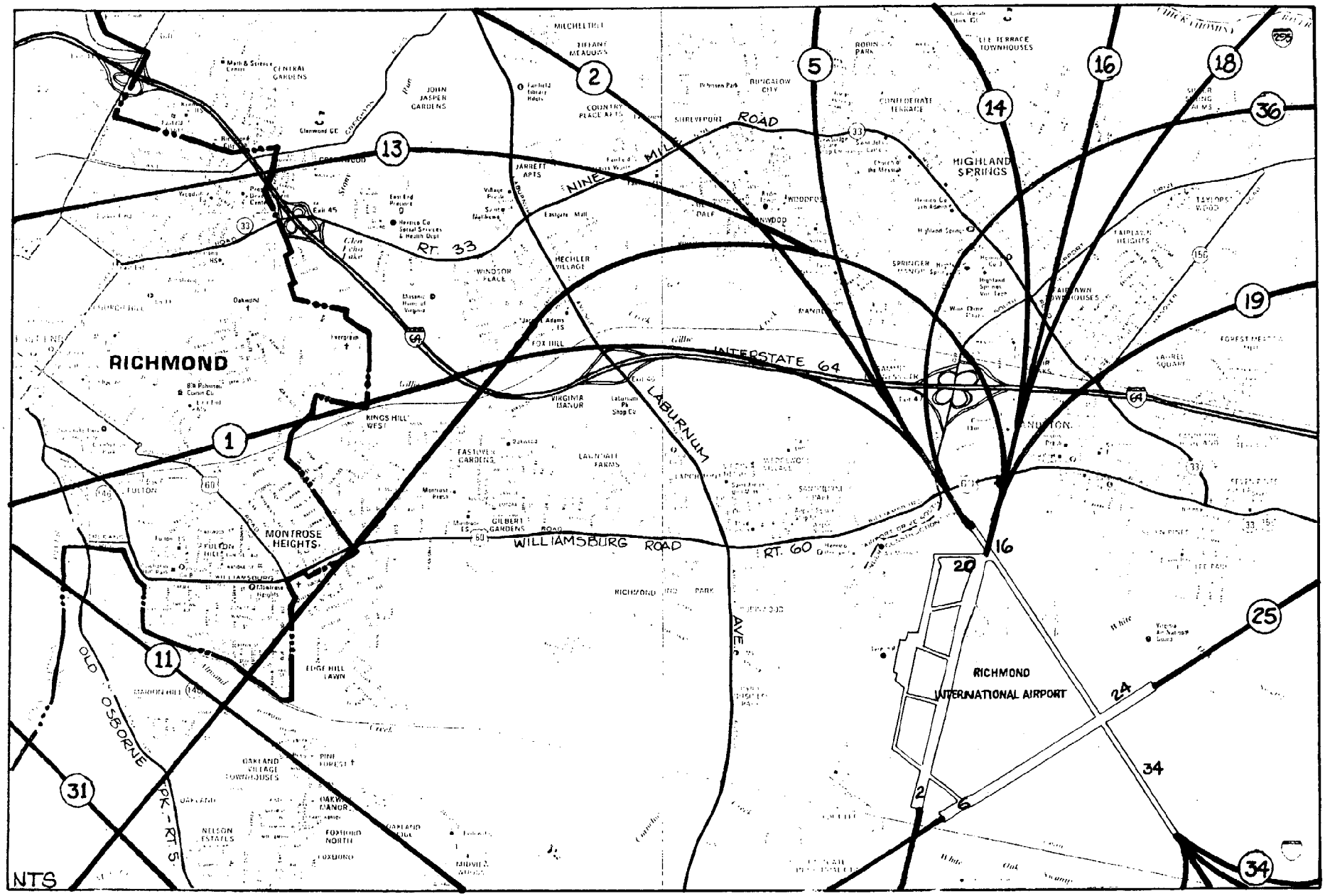
- Multi-engine and jet aircraft shall not be cleared to make practice instrument approaches to runway 20.
- Multi-engine and jet aircraft shall not be cleared to make practice landings on runways 2 and 20.
- Practice "circling" approaches that will result in flight over "noise sensitive" areas shall not be authorized.
- All arriving multi-engine and jet aircraft should maintain an altitude of 1,500 feet above terrain as long as possible.



NOTE: NUMBERS EQUAL PERCENTAGE OF FLIGHTS WHICH ARRIVE ON EACH RUNWAY PER YEAR

EXISTING ARRIVAL FLIGHT TRACKS RICHMOND INTERNATIONAL AIRPORT 1981 DATA

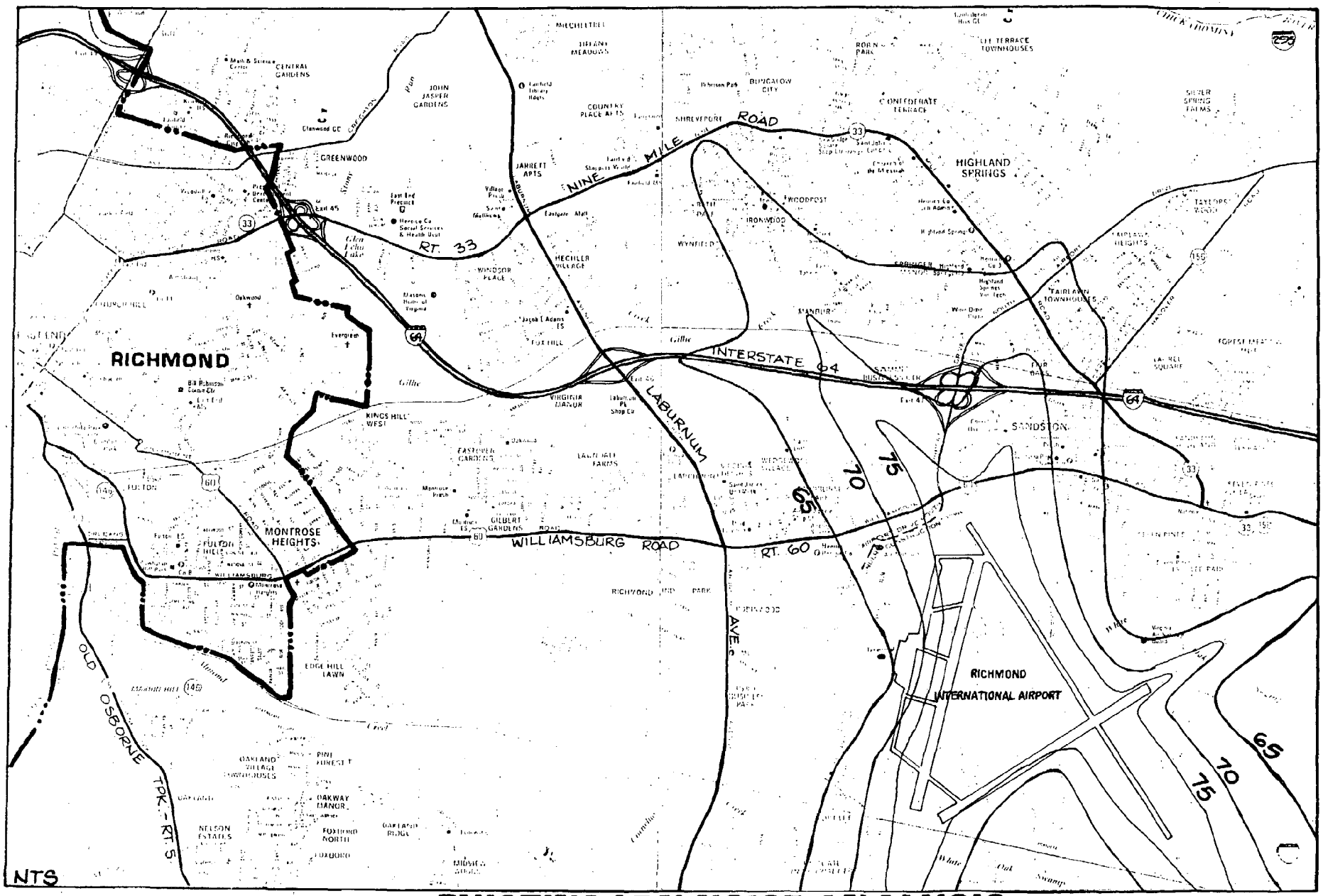
FIGURE ____



NOTE NUMBERS EQUAL PERCENTAGE OF FLIGHTS WHICH ARRIVE ON EACH RUNWAY PER YEAR

EXISTING DEPARTURE FLIGHT TRACKS RICHMOND INTERNATIONAL AIRPORT 1981 DATA

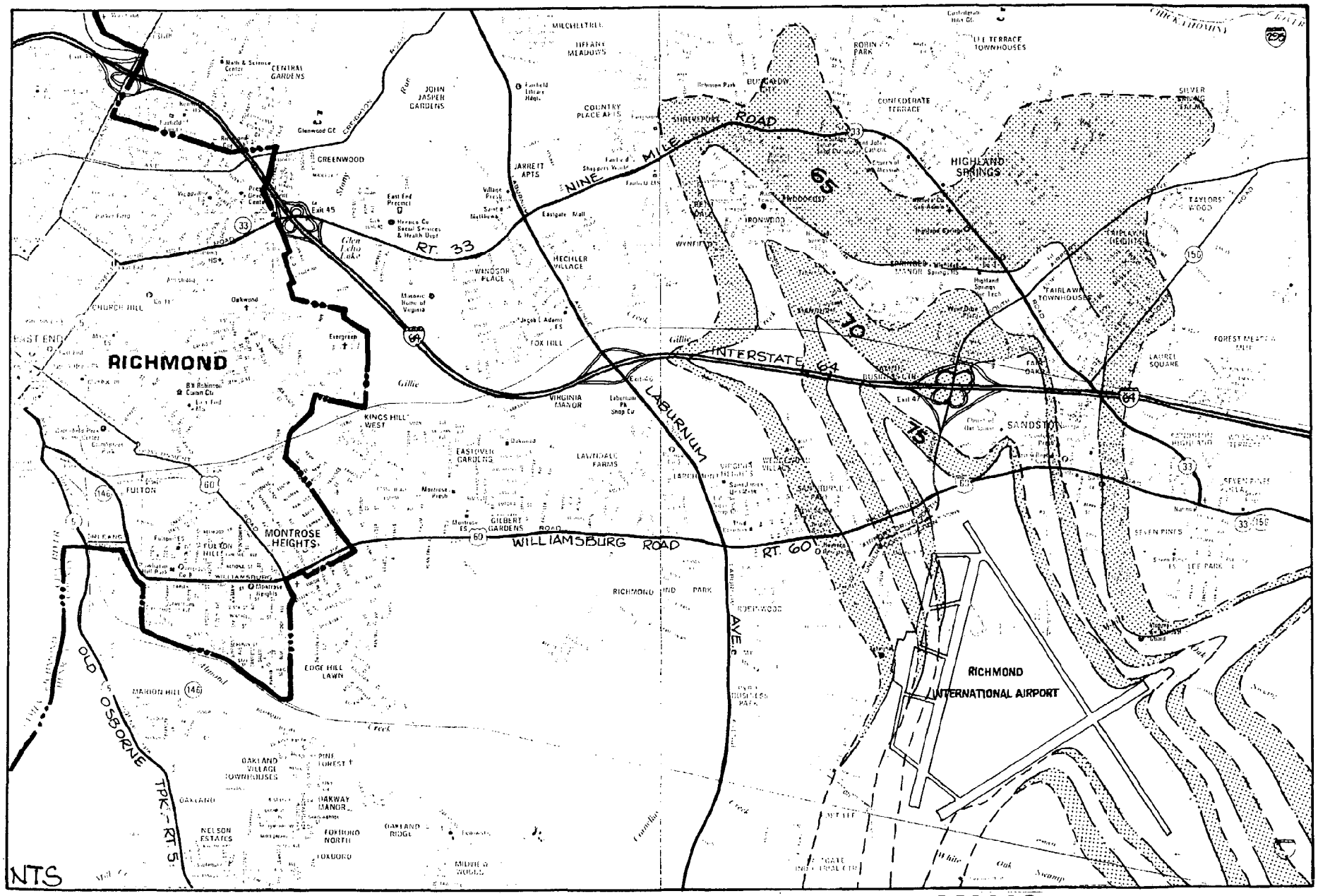
FIGURE ——



1981 DATA

EXISTING LDN NOISE ANALYSIS
CIVIL ACTIVITY ONLY
RICHMOND INTERNATIONAL AIRPORT

FIGURE _____



1981 DATA

EXISTING LDN NOISE ANALYSIS
ADDED INFLUENCE OF MILITARY ACTIVITY
RICHMOND INTERNATIONAL AIRPORT

FIGURE _____

- Pilots of jets and multi-engine aircraft shall be requested to use runways other than 2 and 20 during the hours of 11:00 p.m. to 7:00 a.m. and Sunday from 10:00 a.m. to 12:00 p.m.

In addition to these procedures, the Richmond Tower has developed a program for separation of aircraft so that particularly loud aircraft are kept as high as possible before clearance to land is given.

As of September 1991, the Secretary of Transportation had unveiled plans which would ground the noisiest planes currently flying. Aviation insiders categorize planes into three stages or types: "Stage I" aircraft are so loud that they have already been grounded and taken out of service; "Stage II" aircraft are the loudest currently flying planes; and "Stage III" aircraft are the quietest and would be allowed to operate under the Secretary's plan.

Four of the nine largest commercial airlines in business today service Richmond International Airport. These airlines, the percentage of their fleet that is Stage II or "noisy," and their rank in order of noisy planes include:

AIRLINE	% STAGE II	RANK
Delta	(47.4%)	(4th)
United	(45.0%)	(5th)
USAir	(42.4%)	(6th)
American	(27.8%)	(9th)

As a member of the Capitol Region Airport Commission, the City has the responsibility of representing the views of the City on issues over which the Commission has control. Since the airport is located in Henrico County, the City can not exercise zoning or land use control over the land adjacent to it.

Recommendations

A. Maintain a strong presence on the Capital Region Airport Commission to influence airport planning and decision making which may have an impact on the City of Richmond.

B. Participate in the review of existing and development of proposed new flight paths to ensure that impacts on sensitive land uses within the City are minimized.

C. Ensure that future airport expansion plans consider noise impacts on sensitive land uses within the City of Richmond.

D. Strongly encourage the use of the Noise Abatement Procedures which are only informally enforced by the FAA Richmond Tower. Take measures to see that they become mandatory except in emergency or adverse conditions.

HIGHWAY AND TRANSPORTATION NOISE

OBJECTIVE
ENSURE THAT ALL NECESSARY STEPS ARE TAKEN TO MITIGATE THE IMPACTS OF HIGHWAY AND TRANSPORTATION RELATED NOISE ON RESIDENTIAL AND OTHER NOISE SENSITIVE LAND USES IN THE CITY.

Highway Noise

Highway noise is created by the engines, exhaust systems, and tires of trucks and automobiles. The volume of traffic, the speed of traffic, and the number of trucks determine the level of highway noise generated. Noise levels can be increased by defective equipment and can also be affected by distance, terrain, vegetation, and natural and man-made obstacles.

The Federal Highway Administration (FHA) has established noise impact criteria for land uses located in close proximity to highways. The noise impact criteria are as follows:

- The projected noise levels must reach or exceed a sound level of 67 decibels at its peak hour; and
- a project must create a substantial (defined as ten decibels or more) increase in the noise level.

Some of the noise sensitive activities with which the FHA is most concerned include residences, churches, schools, parks, hotels/motels, auditoriums and public meeting rooms, hospitals, picnic areas, and undeveloped lands. All of the noise sensitive activities identified by the FHA are found adjacent to major highways within the City of Richmond.

The FHA requires that the Virginia Department of Transportation (VDOT) assess noise impacts for any highway project which involves the use of federal funds. If noise impacts are likely to occur, VDOT must evaluate noise abatement measures aimed at reducing or eliminating these impacts. If appropriate noise abatement measures are found to be reasonable and economically feasible they are included as part of the highway project. Noise abatement measures include:

- traffic management to restrict either the speed or types of vehicles permitted on the highway;

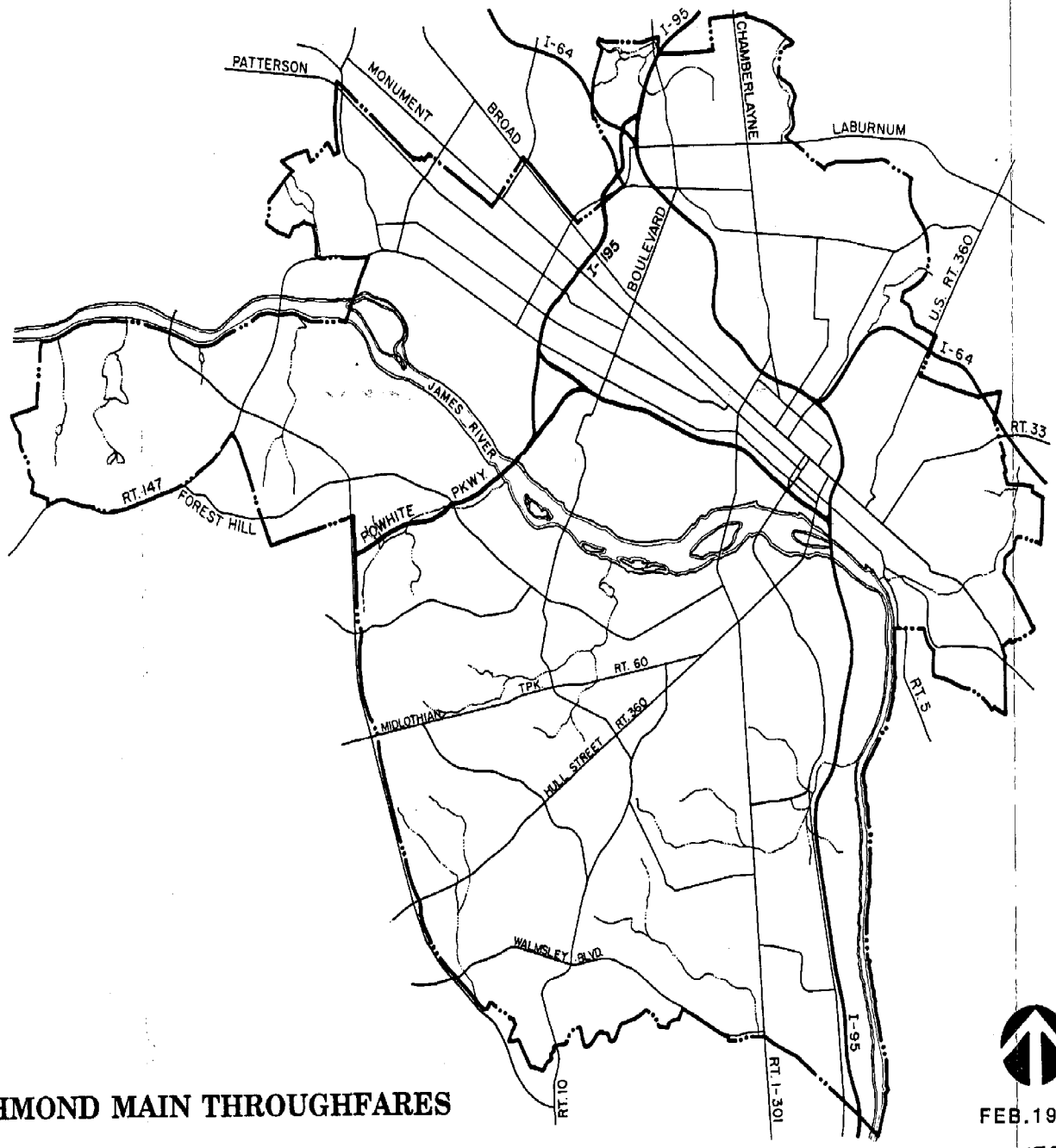
- alignment or route alteration (which applies to new highway construction only);
- the construction of buffer zones between sensitive land uses and highways; and
- the construction of noise barriers.

Noise barriers, either earthen berms or walls, are the primary abatement measure used in Virginia. Noise barriers are solid obstructions built between highways and sensitive land uses, and can reduce noise levels between 10 and 15 decibels. Made of wood, concrete, earth, metal, or some combination of materials, barriers are used to deflect the noise away from sensitive areas. For a barrier to work it must be high enough and long enough to block the view of a road. Any openings in noise barriers destroy their effectiveness. Absorptive barriers, which are used to trap the sound waves and totally eliminate noise, are now being developed and installed on an experimental basis in Virginia.

Recently, Virginia developed its own noise abatement policy as a result of the construction of the Chippenham-Parham connector and the Powhite extension. Virginia's policy applies to any highway construction project within the Commonwealth. For those projects not funded by federal funds, two conditions must be met in order to qualify for noise abatement planning and cost-sharing assistance:

1. The jurisdiction in which the the project is located must agree to pay for 50% of the cost of the noise abatement; and
2. the jurisdiction must have a noise ordinance in place which requires developers to provide noise abatement for any development adjacent to an existing highway or corridor.

The City of Richmond, both individually and as part of the Metropolitan Transportation Planning Organization (MPO), is responsible for working with VDOT to plan for highway systems within the City and region. The following are the existing number of vehicles traveling existing major highways (see figure):



CITY OF RICHMOND MAIN THROUGHFARES

FEB. 1992

NTS

Highway/Location	Count Date	Average Traffic Counts VPD
I-95	1990	68,420 vehicles per day
(Route 1 to Parham Rd)		
I-64	1990	88,250 vpd
(I-95 to the eastern City limits)		
Powhite Parkway	1991	23,485 vpd
(I-95 @ 195 to Route 146)		
Chippenham Parkway	1991	54,806 vpd
(Midlothian Tpke to Janke Rd.)		
Downtown Expressway	1991	
(under the 4th St. bridge)		36,492 vpd
(west of Route 161)		42,744 vpd
Huguenot Road	1991	
(James River Bridge to Kanawha Dr.)		27,172 vpd
(Cherokee Rd. to Chippenham Pkwy.)		21,279 vpd

Although the volume of traffic along the major highways in the City is predicted to increase, there are measures which can be taken to reduce or control highway noise. Quieter cars, achieved through better motor vehicle design, can reduce highway noise. Design initiatives for quieter cars can include fans that turn off when not needed, improved mufflers, and enclosures for engines. Also, the EPA has placed a limit on the noise levels new trucks can emit, and state and local governments can enact regulations which require existing vehicles to be properly maintained and operated.

Land use controls can also be implemented which reduce the level of highway noise. For example, ordinances can be adopted which require the following: reasonable distances between buildings and roads; establishment of buffer zones; planting of vegetation; "soundproofing" or installation of other abatement measures within new buildings; construction of noise barriers to protect noise sensitive land uses; and placement of commercial or industrial rather than residential land uses adjacent to highways and major arteries.

Traffic control measures can sometimes reduce noise problems. Trucks can be prohibited from certain streets and roads, or restricted to daylight hours. Traffic lights can be changed to smooth traffic flow through the city and eliminate the need for frequent stops and starts. Finally, speed limits can be reduced, although a 20 mile per hour reduction is necessary for a noticeable decrease in noise levels.

In the City of Richmond through trucks over 7,500 pounds gross weight are prohibited from 45 locations (unless they were making a delivery to a specific address) by traffic order. In addition, twin tractor trailors are restricted to travelling on designated streets within the City limits.

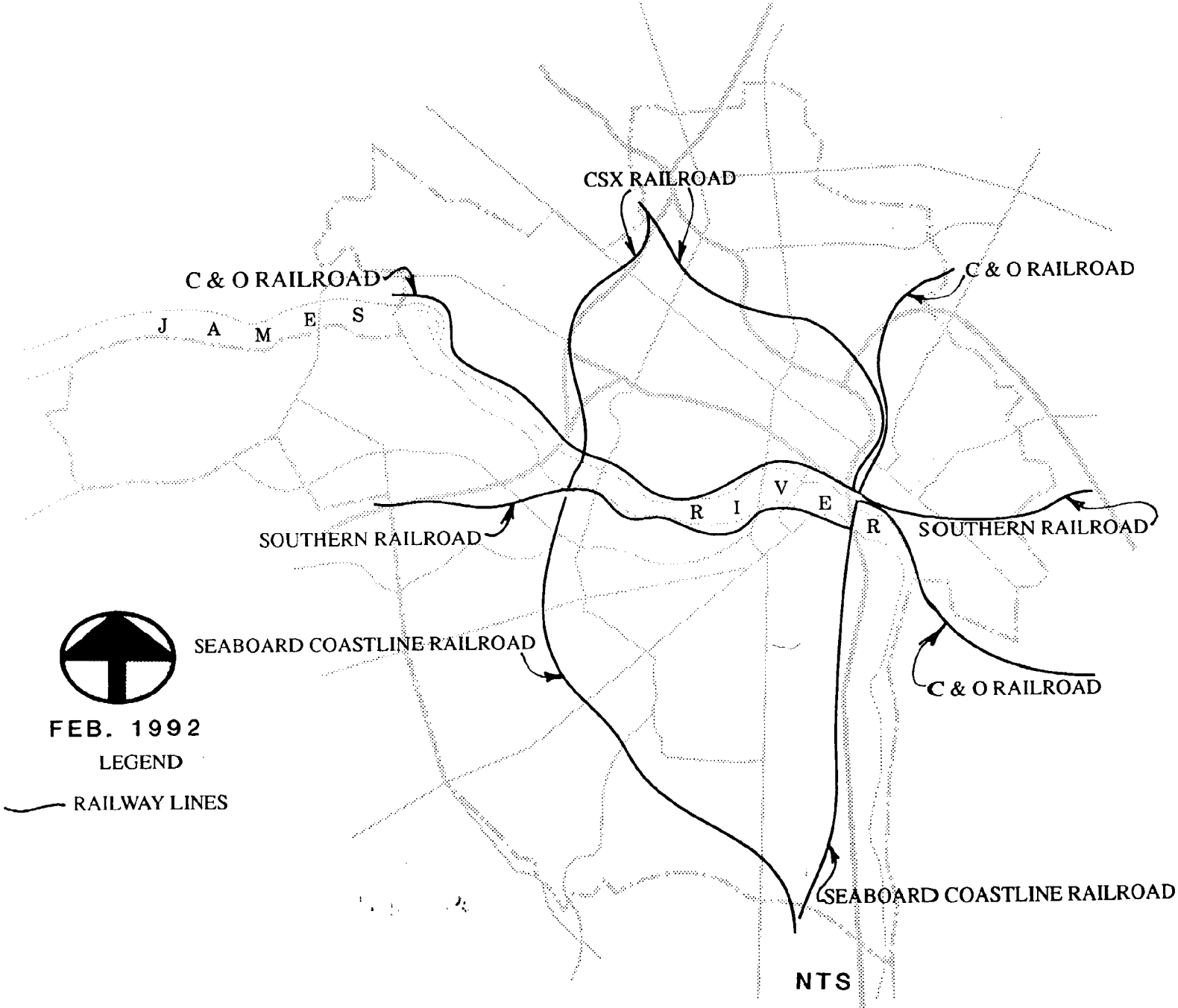
Railroad Noise

Railroad noise is similar to highway noise in that it is linear and confined to a specific corridor along each rail line. At a distance of 50 feet, a passing train produces a sound level of roughly 75 decibels. There are two differences between railway noise and highway noise. First, trains are required by the Code of Virginia to use air horns at crossings to warn motorists and pedestrians of their approach. This creates short bursts of noise that are more irritating than a continuous noise. Secondly, train traffic is much more intermittent than highway traffic, as a result one notices the noise more readily.

Three rail systems have tracks which go through the City of Richmond: Richmond, Fredericksburg, & Potomac Railroad (RF&P), Southern Railway, and Chesapeake and Ohio Railroad (C&O) (see figure). According to the Railway and Public Transportation Division of the Virginia Department of Transportation there are 197 at-grade crossings within the City and an average of 92 trains per day travelling through the City. Since each train is required to sound their horns at each crossing this results in a significant noise impact.

Another element of railway operation that creates a noise impacts are switching and loading yards. There are two areas of the City in which these types of operations take place: the RF&P railyard in the northwest section of the City, and along the southern bank of the James River, adjacent to James River Park. In these areas the background rumble of engines and cars is accompanied by the screeching of wheels and brakes as the trains are assembled.

The EPA is authorized to set noise emission standards for the operation of equipment and facilities which engage in interstate commerce. Any such control strategy must reflect the degree of noise reduction which can be achieved through the application of the "best available control technology." In other words, the acceptability of the proposed standard is determined using a cost-benefit approach. After a standard is established by the federal government, no state or local noise control ordinance may be adopted unless the Administrator of EPA and the Secretary of Transportation determine that there are special local conditions which warrant such an action and the proposed local regulations do not conflict with any national noise emission standards. According to the engineering department of the RF&P, railroads do not take noise impacts into consideration in determining the placement of tracks or facilities. Rail systems will conduct noise impact studies if a complaint is lodged by a resident; however, there are few techniques which can be used to lessen noise effects.



RAILWAYS THROUGH THE CITY OF RICHMOND

FIGURE _____

Railyards are not specifically covered in the City's zoning ordinance; however, the existing railyards are zoned M-1 light industrial. In the M-1 district, noise which is not any more offensive than that created by other permitted industrial uses is tolerated.

Recommendations

A. Ensure that impacts on sensitive land uses within the City are minimized through participation in the process for development of new highways.

B. Adopt a highway noise ordinance consistent with the Virginia Noise Abatement Policy, requiring developers to provide noise abatement for any development adjacent to an existing highway or corridor.

   1. This will qualify the City for cost-sharing with the state for construction and maintenance of noise abatement measures on non-federally funded highway projects.

   2. Incorporate 50% of the cost of noise abatement projects into the capital budget, placing the highest priority on those projects affecting the most sensitive land uses.

C. Evaluate the need for locally implemented noise abatement measures for projects not eligible for cost-sharing and for existing roadways where noise is a problem.

D. Develop a plan for truck routing within the City of Richmond to provide maximum protection of sensitive land uses, particularly residential areas.

   1. Identify and designate appropriate truck routes between industrial and commercial areas and interstate access points which minimize impacts on sensitive land uses.

   2. Coordinate traffic orders which prohibit through trucks from travelling on certain City streets and regulations which permit twin tractor trailers to operate on specific City roads.

   3. Continue to work with VDOT in truck route planning and revision of existing truck routes.

E. Study the relationship between the use of alternative fuels and highway noise.

F. Incorporate regulations which deal with mobile sources of noise such as loud music and ineffective mufflers.

NEIGHBORHOOD NOISE

OBJECTIVE

PROMOTE ACTIVITES WHICH MINIMIZE NOISE LEVELS IN RESIDENTIAL NEIGHBORHOODS.

Neighborhood noise comes from many sources including vehicles, parties, crowds of people, loud music, maintenance and repair work, barking dogs, and delivery trucks. Any of these sources can be disruptive and annoying to residents. The City of Richmond has a noise ordinance which regulates loud, disturbing, and unnecessary noises such as horns and other signal devices, radios, the keeping of animals or birds, operation of vehicles, and the use of drums and loudspeakers, among other things.

Recommendations

A. Continue to rigorously enforce the existing noise ordinance.

   1. Consider an amendment to the existing noise ordinance requiring buses to turn off engines when idling in residential neighborhoods.

   2. Continue to provide police response to noise complaints.

B. Amend the existing land use ordinances to require noise sensitive site design in the development review process.

C. Develop a public education program to inform citizens of the enforcement tools available to them.

GENERAL ISSUES

Chapter 8

INTRODUCTION

Environmental issues are closely interrelated; however, an attempt has been made in the preceding chapters to focus recommendations primarily upon the issues within each chapter. In the process of developing this environmental element several objectives were identified which are broad in scope and apply to all, or at least more than one, of the other issues. Regulatory coordination, environmental review, and public education are all broad areas of concern which apply to all environmental issues.

REGULATORY COORDINATION

OBJECTIVE
COORDINATE THE CITY'S EXISTING ENVIRONMENTAL PROGRAMS AND RESPONSE TO FUTURE REGULATORY REQUIREMENTS THROUGH A CENTRALIZED MECHANISM.

The interrelationship of environmental issues has long been recognized; however, within the City administration, many different agencies are responsible for compliance with Federal and State mandates. Their work includes monitoring existing and pending legislation; and developing, implementing, and administering programs which respond to mandates. During the process of developing this environmental element it has become apparent that a need exists for additional coordination between agencies in order to increase both the efficiency of the City's response to developments in the environmental field, and the effectiveness with which resources are utilized.

Other urban areas have dealt with this situation by creating departments of environmental affairs, or environmental management. Such departments act as oversight agencies, responsible for monitoring pending legislation, technological advancements, efforts being made in similar jurisdictions, and coordinating compliance with mandates. In this manner, the operating responsibility remains with public works, public utilities, etc.

Alternatives which may be appropriate for the City of Richmond include the hiring of one individual who resides in the City Manager's office, development of a committee of environmental experts within each existing department or agency, or creation of a separate division of environmental affairs.

The City of Richmond enjoys a great deal of technical expertise on certain environmental issues; however, this expertise is not formally coordinated and thus is not readily available to agencies in need of it. In other areas, the City

has limited expertise and is reliant upon the State for guidance. This is most apparent in the area of air quality.

Until 1985 the City maintained a department of air pollution control, an effort which was discontinued when it was determined that the State's efforts were adequate to protect the quality of air within the City. That agency was primarily responsible for the monitoring of air quality, duplicating a service already being performed by the State. Since that time the City has been content with relying on the State for air quality control; however, within the past two years, there has been a growing understanding on the part of City staff as to the impact of air quality on issues such as land use, economic development, and public health and welfare. The State's charge is to monitor air quality; the City is on its own regarding these other issues and has become increasingly concerned. One of the recommendations of this section is that this situation be monitored, and a department of air pollution control be reestablished if warranted.

It is recommended that other urban jurisdictions be consulted regarding their coordination of environmental regulatory issues, and that a means of regulatory coordination appropriate for the City of Richmond be developed.

Recommendations

A. Create a mechanism for the coordination of a City-wide approach to environmental issues responsible for the following:

   1. Monitoring the development of environmental legislation;

   2. monitoring the development of technological advancements nation-wide which are applicable to the urban environment;

   3. communicating with other urban jurisdictions regarding compliance with mandates;

   4. communicating mandates affecting the City to appropriate operating agencies; and

   5. coordination of compliance efforts within each agency.

B. Examine/evaluate existing programs to determine if they are achieving City goals, and Federal and State mandates.

C. Implement a water quality program for the City which coordinates the requirements of the City's CBPA, NPDES, erosion and sediment control, and floodplain management programs to provide ease of administration for City staff and compliance for the public.

D. Comply with all Federal and State environmental mandates in a timely manner and through the development of local ordinances consistent with other City programs.

E. Support legislation which requires the simplification and coordination of water quality control agencies at the Federal and State level

F. Monitor the effectiveness of the State's ability to adequately protect the quality of air within the context of the City's concerns about land use, economic development, and public health and welfare.

1. Evaluate compliance of Department of Air Pollution Control permit applicants with local ordinances, including the impacts of proposed emissions.

2. Track nonattainment status under the Clean Air Act and develop programs and policies aimed at achieving attainment in conjunction with state efforts.

3. Monitor emergence of scientific data on air toxics and other non-criteria pollutants as it is developed; and implement land use policy as necessary to protect the health, safety, and welfare of citizens.

4. Monitor scientific data regarding alternative energy sources as it is developed in pursuit of compliance with Clean Air Act amendments by businesses located within the City.

G. Consider reestablishing a City department of air pollution management if it becomes apparent that the State is not adequately representing the City's concerns regarding air quality.

ENVIRONMENTAL REVIEW PROGRAM

OBJECTIVE

DEVELOP A CENTRALIZED REVIEW PROCESS FOR ALL PROPOSED PLANS, PROGRAMS, AND DEVELOPMENT INITIATIVES, WHETHER PUBLICLY OR PRIVATELY GENERATED, DESIGNED TO ENSURE COMPLIANCE WITH ALL APPLICABLE ENVIRONMENTAL REGULATIONS AND PROMOTION OF ENVIRONMENTAL PROTECTION.

A mechanism for the coordinated review of a proposed development plan or a program's compliance with applicable environmental regulations does not exist in City government. This objective would create a process to ensure that proposed development plans or programs meet all applicable federal, state, and local regulations for environmental protection. By centralizing the review process, greater efficiency can be maintained, more effective communication between City departments can be achieved, and the City's expertise in environmental matters can be developed.

Another objective of such a coordination effort would be to aid citizens and businesses in understanding and complying with the environmental regulations they face in conducting their business. Streamlining and clarifying the processes to avoid duplication and expedite processing of permits in reasonable time are also objectives.

Recommendations

A. Review and evaluate all long range plans and plan updates for impact on environmental issues.

C. Incorporate the consideration of environmental impacts into all future planning, land use analysis, and economic studies undertaken by the City.

D. Review all development proposals for their impacts on environmental quality.

E. Evaluate economic feasibility of compliance with environmental requirements when considering alternatives.

PUBLIC EDUCATION

OBJECTIVE
DEVELOP A COMPREHENSIVE ENVIRONMENTAL EDUCATION PROGRAM FOR CITY RESIDENTS, BUSINESSES, AND INDUSTRIES.

The need for a comprehensive public education campaign became apparent during the development of this environmental element. Public education can make or break environmental initiatives made by all levels of government. Incorporating public education programs into the planning process allows for consistent and comprehensive programs. A comprehensive environmental education and participation program makes use of neighborhood organizations, civic groups, businesses,schools, churches, and the media.

Educational materials are a good way to increase the awareness of good environmental ethics. Among the materials that can be used in educational programs are:

- Pamphlets or brochures for the general public describing environmental issues and how each individual can make a difference.

- School curricula for children and teenagers can be developed which explain different environmental issues and also incorporate those issues into a variety of subjects (e.g. arithmetic problems and social studies). Educational materials can also include coloring books, video tapes, and field trips.

- Materials to encourage participation in environmental awareness programs.

Clearinghouses can be established and administered by local governments to provide the mechanisms for citizens and industry to request materials on environmental issues. Clearinghouses typically serve either as a distribution center or as a place to develop and distribute information. Partnerships between the Environmental Protection Agency and local universities often form the basis of clearinghouses, with the EPA possibly providing seed money. It is recommended that the City work with a local university or the Virginia Tech Extension Service to develop a clearinghouse.

Peer matching programs match available expertise with need at all levels. An example of this would be a locality wishing to start a recycling program calling on the expertise of a locality which already has a successful program in place.

Peer matching programs may take a "regional" approach or may have a nationwide scope and they can be administered by local clearinghouses. Information can be distributed in a variety of other ways such as magazine and newspaper articles; public affairs programing on radio and television; public forums and meetings; public utility bills; and public service announcements on radio and television.

Recommendations

A. Increase awareness of environmental issues through the City school system.

   1. Sponsor system-wide contests, fieldtrips, and other activities to foster awareness of environmental issues.

   2. Incorporate environmental education into the existing curriculum of Richmond Public Schools.

   3. Identify wetlands or other environmentally sensitive lands to be utilized as public educational or recreational resources where consistent with their protection.

B. Increase media coverage of efforts by the City and its citizens which concern, and increase awareness of, environmental issues.

   1. Publicize the activities of City agencies and committees or commissions involved in environmental issues.

   2. Sponsor contests and other civic activities focusing on environmental issues as a way to foster civic pride.

   3. Develop an award or recognition program for developers and land owners who exhibit environmentally responsible development.

   4. Include helpful hints on water and other environmental issues in the monthly utility bills.

C. Incorporate demonstration projects for environmentally sensitive land use and development activities into City-owned facilities. Where possible and practical, coordinate such demonstration projects with state agencies and private utilities.

IMPLEMENTATION

Chapter 9

INTRODUCTION

The foregoing chapters have enumerated many policies and recommended regulations, programs, and other actions. The cooperation of many City agencies is needed to carry these out. This chapter summarizes recommended policies and activities in one place to clearly set forth the implementation program needed to turn this planning document into an action tool.

Key recommendations include establishment of an appropriate mechanism to coordinate environmental programs. Such a mechanism would ensure that implementation of proposed programs is undertaken in an efficient manner, and that activities are coordinated among City agencies and with outside entities. A second key recommendation of the environmental element is the development of an Environmental Review Process This represents a major opportunity to incorporate environmental objectives into development plans and to streamline and improve coordination of the review process. A third key recommendation is the development of a comprehensive public education campaign which is essential to the continued protection and enhancement of the City's natural resources.

City agencies which must be involved in the implementation of this element include Community Development, Recreation and Parks, Public Works, Public Utilities, General Services, Economic Development, and the Richmond Public Schools. Effective regulatory coordination is necessary to pursue implementation of the recommendations of this element.

LAND USE PLAN

An amendment to the Land Use Plan has been recommended which will facilitate improved protection of major natural systems: designation of Environmental Protection Areas to protect the valuable system of natural areas throughout the City. As described in the Natural Features chapter, these natural areas serve to protect water quality, wildlife habitat, and sensitive environmental features which are important to the ecological health and economic base of the City.

This overlay district adds specific policy objectives and development guidelines to the existing land use districts and regulations already in place. Administration will be accomplished in the short term within the scope of existing permit review processes and later within the proposed Environmental Review Process when it becomes effective. It is also recommended that Land Use Plan be evaluated City-wide to identify appropriate changes which should be made in response to the policy framework and information base developed as result of this environmental element.

SUMMARY OF POLICIES AND RECOMMENDATIONS

The policies outlined below are not specific actions but rather statements of intention which guide the performance of specific, recommended actions. Following the policies is a brief summary of the specific recommendations proposed in the form of individual programs or projects. These are also elaborated upon in the preceding chapters.

WATER RESOURCES

POLICIES

1. CSOs should be dealt with on a city-specific basis rather than through development of national standards for CSO control.
2. Seek long term solutions to stormwater management issues which rely on regional, neighborhood, and on-site retention.
3. Promote landscape management practices which promote water quality.
4. Support City-wide source control measures which improve the quality of stormwater runoff.
5. Continue stewardship of the James River.
6. Participate in a regional cooperative effort to reduce withdrawal impacts on in-stream flows.
7. Seek legislation for additional control authority to require water conservation fixtures under the BOCA Code.
8. Continue to participate in the RRPDC's Water Resources Task Force.
9. Work to develop a co-operative regional approach to water quality and supply issues.
10. Support formation of a regional water resource management agency.

RECOMMENDATIONS

1. Adopt a stormwater control strategy/program which integrates all stormwater mandates and City goals.
2. Reevaluate the CSO Control Plan periodically to incorporate technical advancements; available information; and changing costs, attitudes, and regulations.
3. Consider expansion of the designated Resource Management Area.
4. Develop a system for open space off-sets in conjunction with the stormwater control strategy/program.
5. Identify potential offset receiving areas throughout the City.
6. Establish a stormwater utility as a financing mechanism for stormwater programs.
7. Continue with the UST removal program.
8. Monitor CERCLIS list sites for potential groundwater contamination.

9. Develop a groundwater management plan.
10. Develop a drought contingency plan.
11. Revise the building code to encourage the use of water conservation fixtures.
12. Develop guidelines for water conserving landscaping techniques.
13. Investigate the use of pricing mechanisms to encourage water conservation on a regional basis.
14. Employ water conservation techniques in City facilities.
15. Implement the sampling, operational and technical requirements of the Safe Drinking Water Act for lead and copper.
16. Develop a monitoring system for other contaminants, toxics and organics.
17. Complete a study to determine the appropriateness of lead service line replacement.

NATURAL FEATURES

POLICIES

1. As major changes warrant, evaluate floodplain and floodway designation and pursue amendment as appropriate.
2. Seek legislation for additional authority to develop a landscape ordinance to require the planting of vegetation on sites where it may not have existed prior to development.
3. Support efforts to fund a fish passage at Boshers Dam.
4. Provide opportunities for public input in all park planning efforts.
5. Provide adequate access to the City's open space and recreation areas.
6. Ensure publicly accessible open space within walking distance of all residents.
7. Prioritize maintenance and renovation of existing parks and recreation areas and development of new facilities.
8. Coordinate the recommended park master plan with the greenways plan and the proposed Environmental Protection Area overlay to ensure a unified, compatible plan.
9. Continue to be an active participant in the Metro Richmond Greenways project.
10. Cooperate with the counties of Henrico, Hanover, and Chesterfield in implementation of the greenways plan.
11. Enhance and preserve the free-flowing nature of the river.
12. Utilize existing land use authority to implement river protection needs.
13. Seek and support development of in-stream flow standards sufficient to support indigenous aquatic life and recreational uses.

14. Seek and support legislation for additional control authority to apply river protection strategies and standards to development within the City.
15. Provide additional public access to the river with an emphasis on accessibility by handicapped citizens.

RECOMMENDATIONS

1. Develop a municipal landscape management program which address maintenance of trees and other landscaping on City-owned properties.
2. Develop a Landscape Ordinance for the regulation of private development projects.
3. Develop a habitat management plan for the City to provide for the preservation and maintenance of habitat.
4. Develop a Fisheries Management Plan for the City to provide for development and management of urban fisheries.
5. Implement plans to breach Williams Island Dam.
6. Identify environmentally sensitive areas appropriate for protection.
7. Incorporate provisions for protection of designated environmentally sensitive areas into City ordinances and review processes.
8. Modify the Floodplain Management Ordinance to incorporate recognition of the various functions of the floodplain.
9. Integrate protection of environmentally sensitive areas with the proposed stormwater control strategy/program.
10. Develop a master plan for parks and natural areas within the City.
11. Designate the Department of Recreation & Parks as the agency responsible for development and maintenance of all plans for parks and natural areas.
12. Review the recreation and open space standards in the Master Plan to determine their continued applicability.
13. Develop long-range plans for each park and natural area which address physical needs and outlines a program for achieving these needs.
14. Develop and implement design standards for use when planning development or renovation of publicly owned property.
15. Develop suitable public lands for use as parks.
16. Plan for availability of funding for parks and recreational facilities through a wide variety of funding techniques.
17. Develop a mechanism, which includes incentives, through which the City can encourage and accept donations for preserving, maintaining, and expanding the park system.
18. Adopt the greenways plan as recommended by the Greenways Advisory Committee.
19. Implement the greenways plan through the CIP, incorporation into City projects and seeking private support.

20. Designate the Department of Recreation and Parks as the agency responsible for development and maintenance of the City greenways.
21. Develop a mechanism by which landowners can donate their property or easements for public access consistent with the greenways plan.
22. Develop a conservation and management plan for protection of the James River and its immediate environs which incorporates existing plans and programs.
23. Develop a program for protection of view-sheds and scenic horizons as seen from the river.
24. Designate an Environmental Protection Area as an overlay to the Master Plan.
25. Create an Environmental Protection District overlay to the zoning ordinance.
26. Develop new policy guidelines to accomplish environmental objectives during review processes.
27. Incorporate the greenways plan into a Master Plan overlay.
28. Review the Master Plan to consider changes to land use designations as appropriate for the protection of natural features.

SOLID WASTE

POLICIES

1. Support minimization and disposal of solid waste consistent with the hierarchy of waste reduction, reuse, recycling, resource recovery, combustion, and landfilling.
2. Support contractual operations which are in compliance with Federal and State mandates.
3. Regulate the transportation, storage, and disposal of hazardous materials and special wastes within the City.
4. Encourage the development of markets for materials collected through recycling programs.
5. Encourage source reduction and recycling through financial incentives and ordinances.
6. Encourage source reduction and recycling through lobbying efforts.
7. Promote the combustion of municipal solid waste on a regional basis as a means of obtaining waste to energy and volume reduction benefits.
8. Continue land application of sanitary sewage sludge in compliance with state regulations.
9. Promote incorporation of an integrated solid waste disposal hierarchy into the regional solid waste plan.
10. Promote development of a comprehensive solid waste management education program for use on a regional basis.

RECOMMENDATIONS

1. Provide opportunities for total participation in recycling and waste reduction programs.
2. Provide facilities which encourage residential participation in recycling and waste reduction programs.
3. Develop a review process to identify any environmental hazards and determine appropriateness of projects proposed on any former public or private landfill sites.
4. Develop mechanisms to regulate the transportation and storage of hazardous materials and special wastes within the City.
5. Contract for transport of hazardous materials and special wastes only with companies with a proven record of environmental compliance.
6. Develop mechanisms which hold the shipper and carrier responsible for clean-up costs in hazardous material or special waste incidents.

AIR QUALITY

POLICIES

1. Seek and support legislation for additional control authority to apply transportation demand management and transportation system management techniques.
2. Encourage increased efficiency in transportation modes.
3. Promote use of mass transit by residents and workers in the City.
4. Support the production of energy by methods which require minimal fossil fuel combustion.
5. Promote the generation of energy through clean processes, utilizing best available pollution control technology.
6. Emphasize the development and use of alternative, non-fossil fuel based sources of energy generation such as alternative nuclear power, solar, bio-mass, and wind.
7. Support the use of energy conservation.
8. Seek and support legislation for additional control authority through the uniform statewide building code.
9. Evaluate the impact of environmental legislation on economic development policies.
10. Adopt a policy of "prudent avoidance" in the absence of conclusive data regarding the risks of exposure to electromagnetic fields.
11. Seek and support a statewide interim standard limiting magnetic field strength near electric power transmission facilities.

RECOMMENDATIONS

1. Develop transportation system management and transportation demand management programs to promote air quality and efficient use of fuel.
2. Convert the City vehicle fleet to alternatively fueled vehicles as soon as practical.

3. Convert the GRTC bus fleet to alternatively fueled vehicles, including electric vehicles as soon as practical.
4. Develop incentives for conversion of private vehicles and fleets to alternatively fueled vehicles.
5. Develop a public education campaign to promote use of mass transit, HOV lanes, flex time, car pools and van pools by individuals and employers.
6. Investigate methods for reducing amount of particulate matter from diesel vehicles and other non-point sources not covered by the CAA amendments.
7. Continue to incorporate innovative and effective energy conservation and management practices into City buildings and facilities.
8. Revise existing City building code to encourage use of energy conservation and management techniques.
9. Develop a public education campaign to increase public awareness of the importance of energy conservation and management.
10. Purchase only furnishings and materials which are free of chemicals known to contribute to sick building syndrome.
11. Develop a program of systematic replacement or improvement of ventilation systems, asbestos containing products, and other products which contribute to the problem.
12. Enact an ordinance regulating smoking in public places pursuant to the Virginia Clean Indoor Air Act.
13. Develop a mechanism for enforcement of smoking regulations in public buildings.
14. Incorporate air quality considerations into economic development planning efforts.
15. Track nonattainment status and develop programs and policies aimed at achieving attainment in conjunction with state efforts.
16. Monitor scientific data regarding alternative energy sources, and air toxics and other non-criteria pollutants.
17. Evaluate compliance of air permit applicants with local ordinances.
18. Develop a public education campaign to raise awareness of the issue of electromagnetism and keep the public informed of developments in the field.

NOISE

POLICIES

1. Encourage the use of Noise Abatement Procedures at Richmond International Airport.
2. Maintain a strong presence on the Capital Region Airport Commission to influence airport planning and decision making.
3. Participate in review of existing and future flight paths to ensure that impacts on sensitive land uses within the City are minimized.

4. Ensure that future airport expansion plans consider noise impacts on sensitive land uses within the City.
5. Participate in the development of new highways to ensure that impacts on sensitive land uses within the City are minimized.
6. Continue to rigorously enforce the existing noise ordinance.

RECOMMENDATIONS

1. Take measures to ensure mandatory enforcement of Noise Abatement Procedures by the FAA Richmond Tower.
2. Adopt a highway noise ordinance consistent with the Virginia Noise Abatement Policy.
3. Evaluate the need for locally implemented noise abatement measures.
4. Develop a plan for truck routing within the City.
5. Study the relationship between alternatively fueled vehicles and highway noise.
6. Incorporate regulations which deal with mobile sources of noise.
7. Amend existing land use ordinances to require noise sensitive site design.
8. Develop a public education program to inform citizens of the enforcement tools available to them.

GENERAL ISSUES

POLICIES

1. Consult with other urban jurisdictions regarding the coordination of environmental regulatory issues within the City administration.
2. Comply with all Federal and State mandates in a timely manner and through development of local ordinances consistent with other City programs.
3. Take a pro-active position on all environmental issues.
4. Support legislation which requires simplification and coordination of water quality control agencies at the Federal and State level.

RECOMMENDATIONS

1. Create a mechanism for the coordination of a City-wide approach to environmental issues.
2. Evaluate existing programs to determine if they are achieving City goals and State and Federal mandates.
3. Implement a water quality program incorporating all existing and proposed water related programs to provide ease of administration for City staff and compliance for the public.
4. Monitor the effectiveness of the State's ability to adequately protect the quality of air within the context of the City's concerns about land land use, economic development, and public health and welfare.

5. Create a process for the review of proposed development plans and programs to ensure they meet all appropriate Federal, State, and local regulations. for environmental protection.
6. Review and evaluate all City plans for environmental impact.
7. Incorporate consideration of environmental impacts into future planning, land use analysis, and economic studies undertaken by the City.
8. Review all development plans for environmental impact.
9. Consider economic feasibility of compliance when evaluating alternative plans.
10. Develop a comprehensive public education campaign for the distribution of information regarding environmental issues.
11. Increase public awareness of environmental issues through City Schools.
12. Increase media coverage of environmental efforts by City and citizens.
13. Incorporate demonstration projects for environmentally sensitive land use and development activities into City-owned facilities.

LEGAL APPENDIX

FEDERAL LEGISLATION AND PROGRAMS

RIVERS AND HARBORS ACT OF 1899

One of the most important federal statutes regulating wetlands is the Rivers and Harbors Act (RHA). The focus of the RHA is the protection of navigation in U.S. waters.

Section 10 of the RHA forbids excavation or construction in navigable waters without approval of the Secretary of the Army. This program is administered by the U.S. Army Corps of Engineers (ACOE). Under Section 10, a permit must be obtained from the ACOE before obstructing navigable waters or altering or modifying the "course, location, condition or capacity," of any navigable waters. Activities outside navigable waters but which affect navigable waters may also be covered under Section 10.

THE FEDERAL WATER POLLUTION CONTROL ACT OF 1972 (FWPCA)

The FWPCA was enacted to address the failure of water quality standards to control water pollution. The goals of the act were that all waters would be "fishable and swimmable" by 1983 and the discharge of pollutants into navigable waters were to be eliminated by 1985. The emphasis of the act was shifted to technology based standards imposed on point discharges under the National Pollutant Discharge Elimination System (NPDES).

Point source discharges are controlled through the use of NPDES permits. Point source pollution is that which comes from any "confined, discrete conveyance such as a pipe, ditch or outfall". In Virginia the program is administered by the State Water Control Board (SWCB) and the permits are called Virginia Pollutant Discharge Elimination System (VPDES) permits. These permits establish effluent limitations for each significant pollutant found in the discharge. The discharger must meet either the federal guidelines for these pollutants or Virginia's water quality standards, whichever is more stringent.

Under the VPDES program, each discharger must meet effluent limitations and standards. These standards are established for each major manufacturing industry. Publicly owned treatment works (POTWS) are required to meet secondary treatment standards or established water standards, whichever is more stringent. There are also monthly reporting requirements based on the effluents and their effects.

Section 208 of the plan recognizes the significance of non-point source pollution. EPA defines non-point source pollution as:

> Pollution caused by diffuse sources that are not regulated as point sources and normally is associated with agricultural, silvicultural and urban runoff, runoff from construction activities, etc. It results from land run-off , precipitation, atmospheric deposition, or percolation.

Section 208 requires the development and implementation of area wide waste treatment management plans which include both point and non-point source control programs. A major portion of these planning efforts were the development of best management practices (BMP's). BMP 's are practices or combination of practices which are determined by a state or planning agency to be the most effective practicable means of preventing or reducing the amount of pollution generated by non-point sources to a level compatible with water quality goals.

The FWPCA has been amended several times , including the 1977 CWA amendments. The FWPCA and its amendments are known collectively as the Clean Water Act (CWA). The 1977 CWA emphasized implementation measures for BMP's and the SWCB prepared an implementation handbook to accompany the BMP handbooks.

WATER QUALITY ACT OF 1987

In response to the ineffectiveness of section 208 the Water Quality Act of 1987 created a new program for the control of non-point sources of pollution.

The governor of every state must submit a state assessment report. The report must;

- Identify problem waters that do not meet or cannot be expected to meet CWA goals;
- identify categories and subcategories of non-point sources as well as individual sources that add significant pollution;
- describe the BMP's & measures to control these non-point sources and to reduce their pollution to "the maximum extent practicable;" and
- identify state and local programs for controlling such pollution.

The governor must also develop a management program to control non-point source pollution. The program must:

- Identify BMP's taking into account impacts on groundwater quality;
- identify programs to achieve BMP's;
- contain a schedule with annual milestones for implementation of state programs to achieve BMP's at the "earliest practicable date;"
- have assurances of adequate enforcement of the program;
- identify sources of funding; and
- identify applications for federal development projects and federal financial assistance.

The program is to be developed on a watershed by watershed basis to the extent possible.

SECTION 404 OF THE CLEAN WATER ACT

The U.S. Army Corps of Engineers (ACOE), in cooperation with EPA administers the federal program to regulate certain activities in wetlands. In general all development within bodies of water, and wetlands which are defined as waters of the United States, requires a permit from the ACOE.

The ACOE and EPA now accept the following definition for "waters of the United States."

- All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce including all waters which are subject to the ebb and flow of the tide;
- all interstate waters including interstate wetlands;
- all other waters such as interstate lakes, rivers, streams (including intermittent streams) mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, or natural ponds that the use, degradation or destruction of which could affect interstate or foreign commerce;
- all impoundments of waters otherwise defined as waters of the United States under this definition;
- the territorial sea; and
- wetlands adjacent to waters (other than waters that are themselves wetlands) identified above.

Exemptions from this permitting process include:

- Maintenance or reconstruction of dams, breakwaters and other similar structures;
- construction or maintenance of farm ponds or irrigation basins and drainage ditches;
- construction of temporary sedimentation basins on a construction site that do not put fill materials into navigable waters;
- temporary roads for construction or maintenance of farm roads forest roads or roads for mining equipment constructed in accordance with BMP's; and
- activity with respect to which a state has an approved non-point source management program.

Applications for permits from the ACOE, require coordination with the US Fish And Wildlife Service and the National Marine Fisheries Service and other advisory agencies.

SECTION 405 OF THE CLEAN WATER ACT STORMWATER MANAGEMENT

Under Section 405, municipalities with populations of 100,000 or more and many industrial facilities are required to obtain NPDES permits for stormwater discharges into state waters. The regulations also require municipalities and industries to submit a stormwater pollution management plan as a part of their permit application. EPA may also require the development and implementation of even more comprehensive management programs to reduce stormwater pollution. Such programs would identify and remove illegal connections to storm drains, stop improper dumping of oil and other wastes into storm sewers, prevent and control spills, and reduce pollution in runoff from other sources.

While stormwater runoff begins as non-point source pollution, it is ultimately discharged through pipes, which are point sources requiring NPDES permits under the CWA. Permit applications from affected industrial facilities are due one year after publication of the regulations, on November 1991. Applications for municipalities are to be submitted in two parts: Part 1 identifies pollution sources, pollutants and affected waterways; and Part 2 consists of the comprehensive management program. Large municipalities of 250,000 or more must submit Part 1 by November 1991, medium-sized municipalities of 100,000 to 250,000 must submit Part 1 by May 1992. Part 2 is due one year after submittal of Part 1.

THE SAFE DRINKING WATER ACT AND THE NATIONAL PRIMARY DRINKING WATER REGULATIONS FOR LEAD AND COPPER

The Safe Drinking Water Act (SDWA) is designed to assure the safety of water supplies for human consumption. It only applies to groundwater used as a source for drinking water. The SDWA protects drinking water through four methods:

- The use of maximum contaminant levels, national standards setting the necessary purity level for drinking water;
- a wellhead protection program;
- a program to protect sole source aquifers , aquifers that are the primary source of drinking water for an entire community; and
- a program to control underground injection of waste.

Pursuant to the SDWA, EPA has adopted the National Primary Drinking Water Standards that prescribe the maximum permissible levels of certain contaminants (maximum contaminant levels or "MCLs") in water delivered to end-users connected to any public water system. EPA sets National Primary Drinking Water Standards at a level to protect the public health for "public water systems." States may adopt their own standards so long as they are at least as stringent as the federal standards. After EPA approval, a state may assume responsibility for administering and enforcing the Act's requirements.

The EPA sets Primary and Secondary Drinking Water Regulations for drinking waters. The National Primary Drinking Water Regulations (NPDWRs) are enforceable standards to protect public health: the National Secondary Drinking Water Regulations (NSDWRs) are nonenforceable aesthetic standards to protect the public welfare. NPDWR's require compliance with Maximum Contaminant Levels (MCL's) or treatment techniques for contaminants that may have adverse effects on the public health. EPA is required to meet a schedule for regulating the contaminants The secondary regulations are set to control contaminants affecting the odor, appearance, taste or aesthetics of water.

The 1986 amendments created two programs, the Wellhead Protection Program, and the Sole Source Aquifer Program. By June of 1989 every state is to submit to EPA a program to protect "wellhead protection areas" from contamination. A "wellhead protection area" is the surface and subsurface area surrounding a water well or wellfield, supplying a

public water system, through which contaminants are reasonably likely to move toward and reach such water well, or wellfield.

The state program must determine the boundaries of each wellhead protection area, identify all potential "anthropogenic" sources of contamination that may endanger public health, designate the state agency responsible for administering the program, describe the program's methodology for protection, and provide contingency plans for alternative water supplies to contaminated water.

The Sole Source Aquifer Demonstration Program is a grant program that reimburses states for 50 percent of their costs in developing and implementing state programs to identify and preserve "critical aquifer protection areas." A "critical aquifer protection area" is generally an area that meets EPA's criteria which measure the susceptibility of the aquifer to contamination, the number of people using the groundwater as a drinking source, and the costs and benefits of protection for an area that was designated as a sole source aquifer, for which there was an areawide groundwater protection plan approved under section 208 of the CWA. State, municipal, local government, and regional planning entities with approval of the governor, may apply for funds.

Each program under section 1427(b) must contain:

- A map outlining the boundaries of the protected areas;
- identification of sources of groundwater contamination;
- assessment of the relationship between land activities and groundwater quality;
- specific actions and management practices to prevent groundwater contamination; and
- identification of authorities to implement the plan, estimates of costs, and sources of state matching funds.

Programs must be adopted with public hearings and federal consultation. The total amount of funding for any one aquifer may not exceed $4 million in any single fiscal year.

The Underground Injection Control Program (UIC) is a program to regulate deep well injection of wastes into "dry" wells. The program is based on four types of regulations:

- General criteria and performance standards;
- standards and procedures for approval of state programs;

- provisions from state programs approved in whole or in part by EPA; and

- procedural and substantive permit requirements administered by EPA in states that do not have approved programs.

The extent of regulation of a deep injection well depends upon the regulatory category that encompasses the well. The requirements for each type of regulated well are administered through a permit system by the states or by EPA in states that do not have an approved program.

COASTAL ZONE MANAGEMENT ACT 1972 (CZMA)

The Coastal Zone Management Act was created to deal with the conflict between development of coastal resources and the preservation of coastal resources. it was enacted by Congress to preserve and develop the resources of the coastal zone, to preserve the unique values of coastal lands and waters by encouraging states to devise land and water use plans for coastal protection.

The CZMA provides funds to states that develop and implement programs for management of land, and uses consistent with the acts standards. With an approved program, federal agencies, permitees, and licensees must demonstrate that their proposed activities, (including certain oil and gas activities on the outer continental shelf) are consistent with the state's management program.

The Coastal Zone Management Improvement Act of 1980, as amended in 1990 is administered by the secretary of Commerce, who has delegated that authority to the Office of Ocean and Coastal Resource Management in the National Oceanic and Atmospheric Administration.

The second policy of the act is to encourage state responsibility for the resources of the coastal zone through management programs. The programs should provide for:

- The protection of natural resources;

- the management of coastal development to minimize loss of life and property;

- improve water quality;

- public access to coastal recreation;

- redevelopment of deteriorating urban waterfronts and ports and preservation and restoration of historic, cultural and aesthetic features; and

- coordination with planning, conservation and wildlife management agencies of the state and federal government.

Program approval is based on the following requirements:

- Must provide for management of land and water uses having a direct and significant impact on coastal water, and take steps to protect significant resources such as wetlands, beaches, dunes and barrier islands.

- must contain three broad classes of policies that relate to; resource protection; management of coastal development; and simplification of governmental processes.

- the policies must be appropriate to the nature and degree of management in the area, with resources identified as subject to the program.

- the policies, standards, objectives, and procedures by which program decisions will be made must provide a clear understanding of the content of the program.

WILD AND SCENIC RIVERS ACT

The Wild & Scenic Rivers Act is designed to protect rivers and sections of rivers with environmental or recreational value in their free-flowing condition, free from dams or other construction.

Rivers are to be chosen based on considerations of water quality and conservation of the "scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values" that these rivers possess. To facilitate this conservation the act establishes the National Wild and Scenic Rivers System which is made up of:

- Wild river areas;

- scenic rivers areas;

- recreational river areas.

Provisions are made for the acquisition of land, water areas and "scenic" easements. There are restrictions on water resources projects, mining and other disposal, in Wild and Scenic River Areas.

Eligible rivers must be a free-flowing stream, and must possess values the act is trying to protect. Wild and Scenic Rivers are administered by the Secretary of the Interior as part of the National Park System. The Secretary of the Interior encourages states to include Wild and Scenic River protection in their comprehensive statewide outdoor recreation plans.

NATIONAL FLOOD INSURANCE PROGRAM (NFIP)

This program requires that all member communities incorporate minimum construction standards for development in flood hazard areas. These standards were developed by the Federal Emergency Management Agency (FEMA), and are based on 100 year floods, and include the following:

- Floodway Development - The floodway must be kept clear so that floodwaters may discharge downstream. Permits are required for any construction, and it must be demonstrated that the construction will not increase flood height; and

- Floodway-fringe Development - Development may occur in the floodway-fringe provided it complies with all applicable elevation and flood-proofing standards.

Local governments may also use one or a combination of the following strategies for guiding floodplain development:

- Land Acquisition and Relocation - public ownership of the floodplain can be used to prevent unwanted development. Relocation, while expensive, is another alternative;

- Zoning Regulation - can be used to maintain low levels of density in the floodplain. Nonconforming uses, such as multi-family dwellings, can also be regulated;

- Incentives and Disincentives - these include tax policies, capital improvement policies, and whether or not to participate in the NFIP;

- Public information - can divert development away from flood hazard areas by affecting private development decisions.

LEAKING UNDERGROUND STORAGE TANK PROGRAM (LUST)

In the early 1980's, the EPA discovered that a widespread cause of groundwater contamination was leaking underground storage tanks. The exclusion in Superfund, of petroleum products, prevented the EPA from conducting cleanup of groundwater contaminated by UST's. Storage tanks were not regulated in any way because they contained a product, not wastes which are regulated under RCRA. Amendments in 1984 and 1986 created subtitle1 of RCRA, the underground storage tank program, known as the LUST program.

The program directs the EPA to set national performance criteria for tanks containing regulated substances.
Owners of existing tanks taken out of service after 1973 and of new tanks after 1985 must send the state agency notice of the tanks, including the age, size, type, location, and use of each tank. Transporters must inform tank owners of the notification policy, and anyone selling tanks, must also tell the owner about the notification policy. Exclusions from LUST:

- residential tanks 1100 gallons or less;
- heating oil tanks for use on premises;
- septic tanks;
- ponds and lagoons;
- stormwater collection systems;
- above floor tanks.

WATER POLLUTION PREVENTION AND CONTROL ACT OF 1991 (WPPCA)

Senate Bill 1081, short titled the Water Pollution Prevention and Control Act of 1991, amends and reauthorizes the Clean Water Act. Several of its 28 sections will have an effect on the City's management of its water resources. Among these are:

SECTION 8: Strengthens water quality provisions of the Clean Water Act. States are to adopt use designations as well as water and sediment quality standards for all water bodies. States are also to designate outstanding national resource waters and assure that the quality of such waters is protected and maintained.

SECTION 12: Directs the EPA Administrator and local control authorities (in this case the City of Richmond) to promulgate regulations establishing pre-treatment standards and local limits for the introduction of toxic and nonconventional pollutants into sewage treatment plants. Local limits must be established for each industrial user that is not otherwise subject to a national pre-treatment standard. The City of Richmond has an established pre-treatment program required of all industrial users.

SECTION 14: Directs sewage treatment facilities serving populations of 50,000 or more to develop and implement, within three years of the adoption of the CWA Reauthorization, a Toxic Reduction Action Program to prevent the introduction of non-industrial toxic pollutants into sewage treatment plants. This program will identify categories of sources which contribute toxic pollutants to the effluent treated at the sewage treatment plant (STP). The local authority must then develop an interdiction program which will keep the pollutants associated with these sources from the STP. Among the sources that must be identified and considered in the program are:

- Waste oil disposal;
- household products;
- car and truck washing operations;
- medical and dental laboratories;
- paint and related product disposal;
- dry cleaning facilities; and
- photofinishing facilities.

SECTION 15: Directs EPA to publish guidelines specifying minimum elements of State non-point source pollution management programs.

SECTION 16: Authorizes the EPA to support management conferences for major river systems of national significance. Management conferences are to assess the overall condition and management plans to protect these resources. River systems will be evaluated on the following criteria:

- Rivers in which there are significant violations of quality standards;
- systems which require controls over point and non-point source pollution to protect a public water supply and a balanced population of fish, shellfish, and wildlife;

- systems in which maintenance of the environmental quality is necessary to protect a natural resource of national significance; and

- systems which are nominated by the Governor for consideration.

SECTION 20: Requires States to inventory overflows from combined stormwater systems (CSOs). Municipalities with CSOs are to develop and implement CSO elimination programs within three years of enactment of the CWA Reauthorization. This program must identify system modifications, BMPs, regulatory and non-regulatory programs, and other measures to be taken for the elimination of CSOs and must identify treatment methods for those overflows that cannot be eliminated. These programs must be implemented as expeditiously as possible; however, in no case shall implementation be more than seven years after program approval by the EPA (five years in the case of "problem" water bodies). Control programs must be adequate to prevent overflows resulting from a one-year, six-hour storm event.

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

RCRA regulates hazardous waste management and to a lesser extent, the management of non-hazardous solid waste. The purpose of the permit system of RCRA is to provide a "cradle to grave" system of documentation, identifying hazardous waste and controlling its treatment, storage and disposal. Facilities handling hazardous waste are classified as a generator; a transporter; or a treatment, storage or disposal (TSD) facility.

Each operation has its own set of regulations. Generators must identify waste as hazardous and notify EPA and the state authorities. Then they must prepare a manifest when the waste is shipped off site, which would identify the waste and and its source. Transporters are given an identification number and must carry the manifest with them and deliver the manifest to the final destination. When treatment facilities accept waste they must return a manifest copy to the generator.

Treatment, storage and disposal of hazardous waste at a "facility " without a permit under RCRA or "interim status" is prohibited. Interim status was provided by the EPA to expedite the approval of state programs. Owners and operators are responsible for obtaining a permit, without which a facility cannot operate. Permits can be obtained from the EPA or designated state agency, in states with approved programs (see Virginia UST program). New facilities must obtain permits prior to construction. Facility

permits consist of general requirements, categorical requirements for the relevant category of facility, and often requirements for the specific facility negotiated with the EPA or the state agency. The general requirements include:

- minimum design standards;
- operating requirements;
- evidence of financial responsibility;
- liability insurance against third party claims for physical injury and property damage;
- closure and post closure requirements; and
- subpart F imposes stringent groundwater monitoring requirements.

The focus of categorical requirements has been on land disposal because it can be the most detrimental to groundwater.

To prevent contamination the EPA and Congress have restricted disposal of liquids in landfills, established performance standards to prevent leakage and phased out land disposal of many hazardous substances.

Some of the new performance standards for new hazardous waste facilities and for expansions of existing landfills and surface impoundments are:

- there must be at least two liners, with a collection system to collect leachate above and between the liners;
- groundwater monitoring for leak detection; and
- requirements for the phasing out of land disposal on an automatic schedule.

While most of RCRA focuses on prevention of contamination, section 7003 addresses the problem of remedying contamination which has already occurred.
Under 7003 EPA may sue in district court any past or present owner or operator, any past or present generator, and any past or present transporter, who has contributed or is contributing to such handling, transportation, storage, treatment, or disposal that would compel corrective actions.

COMPREHENSIVE ENVIRONMENTAL RESPONSE COMPENSATION AND LIABILTY ACT OF 1980 (CERCLA OR SUPERFUND).

CERCLA is administered by the EPA, and regulates the identification and clean up of sites containing hazardous substances. There are currently 21 Superfund sites, none of which are in the city of Richmond. The purpose of CERCLA is to remedy contamination after it has occurred. Whenever there is a "release of a hazardous substance, or a threat of release of a pollutant or contaminant, which may present an imminent and substantial danger to the public health or welfare, EPA may respond under Section 104 by taking a "removal" action or a "remedial" action.

Procedures for both response and removal actions are set out in a National Contingency Plan. Both actions are designed to clean up contamination, particularly when no responsible parties can be found, or required to do so.

To finance cleanup, a revolving trust fund (the Superfund) is established through CERCLA, funded by taxes on petrochemical feedstocks, crude oil, general corporate income, and by general revenues. The funds may be reimbursed for response costs by "responsible parties" for the contamination. If responsible parties refuse to reimburse the fund they can be sued by EPA. States, local governments and private parties can be reimbursed from the Superfund. A list of sites , which EPA has received from the states, members of Congress, private citizens and EPA itself, comprise the Comprehensive Response Compensation and Liability Information System (CERCLIS).

Each site on the list is reviewed in a preliminary assessment to determine whether EPA has jurisdiction and whether there is a substantial release or substantial threat of release of a hazardous substance. Based on a site inspection, EPA determines whether a removal, or long term remedial action is necessary. If a remedial action is necessary, EPA must first rank the site on the National Priorities List (NPL).

Section 105 (a)(8)(A) requires the president to develop the criteria for "taking remedial action, and to the extent practicable, taking into account the potential urgency of such action, for the purpose of taking removal action". President Reagan delegated this authority to the EPA in Executive Order 12316.

EPA only engages in remedial action at sites on the NPL, and must rank all releases on the list, in order of priority. To rank sites, EPA must consider their relative risk, taking into account, to the extent possible the population at risk, the hazard potential of hazardous substances at such facilities, the potential for contamination of drinking water supplies,

and the potential for human contact. They must also consider the potential for destruction of sensitive ecosystems, and the damage to natural resources which may affect the human food chain. They should also consider the risk associated with any release or threatened release, of contaminants into the ambient air, and state preparedness to assure state costs, and responsibilities and other appropriate factors.

The first step in a remedial action consists of two studies: a "remedial investigation which evaluates the nature and damage from the contamination" and a "feasibility study which evaluates potential remedies." The state must agree to provide at least 10 percent (50 percent for some sites under state ownership) of initial cleanup costs and assume responsibility for maintenance costs, except those for the first ten years of groundwater treatment. A state may also voluntarily assume EPA's role within the state. EPA must publish notice of its final remedial plan and provide an opportunity for public comment and a public hearing, and publish notice of its final plan.

Since November 8, 1988, RCRA's prohibition against disposal on land of untreated waste applies to wastes generated in CERCLA cleanups. For Groundwater cleanup, the water must be within the standards outlined in the Safe Drinking Water Act.

Section 106 empowers the federal government to sue to abate any "imminent and substantial endangerment to the public health, or welfare of the environment caused by an actual, or threatened release of a hazardous substance from a facility." The government also may issue administrative orders under section 106 "as may be necessary to protect public health and welfare and the environment". EPA must provide notice and an opportunity for informal public participation in the selection of remedies under section 106.

Section 107 delineates the potentially responsible parties (PRP's) for cleanup costs under CERCLA. The first category of PRP's includes, generally any owner or operator of a vessel or "facility". Persons who were owners and operators of a facility at the time of disposal of any hazardous substance are also potentially responsible. Also included as responsible parties, are persons who arranged for transportation of hazardous substances, or arranged for treatment or disposal of hazardous substances, owned or possessed by them at a facility for which response actions are required. Transporters who accept or accepted hazardous substances for transport to a facility selected by them, are the final category of PRP's.

SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) TITLE III (THE EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT)

(SARA) Title III was enacted by Congress in order to create a local and state emergency planning structure to cope with hazardous materials and chemical disasters. SARA Title III requires every facility which has on hand any "extremely hazardous substance" in excess of established threshold planning quantities to report this fact, and to plan for an emergency response to any substance release. There are currently 366 substances on the extremely hazardous substances list, and the threshold planning amounts range from one pound to 10,000 pounds. There is a separate list of 304 toxic chemicals and 20 chemical compounds for which a Toxic Chemical Release Inventory Reporting Form must be filed if more than the threshold amount of any toxic chemical is manufactured, processed, or otherwise used during the prior calendar year.

In Virginia, SARA Title III is implemented by the Virginia Emergency Response Council (VERC). The VERC is required to supervise and coordinate local emergency planning activities, and establish procedures for receiving and processing requests for public information on the existence and location of hazardous chemicals and extremely hazardous substances. The VERC has divided Virginia into 114 Emergency Planning Districts. Each district has a Local Emergency Planning Committee (LEPC), whose members are appointed by the VERC. Each Qualifying Facility (facilities which have reportable amounts of extremely hazardous materials) must designate a facility emergency coordinator. The coordinator acts as a liaison between the facility and the VERC. SARA obligates each LEPC to prepare an emergency plan to prepare a locality to respond to releases of hazardous substances within its boundaries. Owners and operators of Qualifying Facilities are required to notify the LEPC of any relevant changes in their status, and must provide the LEPC information necessary for developing and implementing the Emergency Plan.

HAZARDOUS MATERIALS TRANSPORTATION ACT

Hazardous Materials Transportation Act empowers the Secretary of Transportation to designate certain forms and quantities of materials to be "hazardous." Among the materials classified as hazardous are explosives, radioactive materials, flammable materials, poisons, and compressed gases. The Act also empowers the Secretary to develop regulations which include criteria for the proper handling of hazardous materials. These include levels of training and number of personnel; the type and frequency of inspections

that may occur at facilities which generate or store hazardous material for transportation; and specifications used for the notification and labelling of hazardous materials. In addition to these regulations, the Secretary may require that any person who transports hazardous material, or causes hazardous materials to be transported, to register with the United States Department of Transportation.

THE 1990 CLEAN AIR ACT AMENDMENTS

The Clean Air Act (CAA) of 1970 directed the EPA to establish health effects-based national ambient air quality standards (NAAQS) for certain designated air pollutants that would, with an ample margin of safety, protect sensitive populations from adverse effects. EPA was further directed to review these standards periodically and to add or delete pollutants based on current evidence of health effects.

These designated pollutants are called criteria pollutants and currently consist of:

- sulfur dioxide (SO_2);
- nitrogen dioxide (NO_2);
- carbon monoxide (CO);
- ozone (O_3);
- lead (Pb); and
- suspended airborne particulate matter (dust) with a particle size of less than ten microns in diameter (PM-10).

The ambient concentration of these pollutants is measured and an area either does or does not meet the standard. If an area does not meet the standard it is classified as a nonattainment area and control measures must be imposed to bring the area into attainment. Under the original CAA no distinction was made between areas just barely in violation of the standard and those that greatly violated the standard, and in both cases the same length of time was given to reach attainment status. This arrangement was both inequitable and unworkable.

The Clean Air Act Amendments of 1990 were enacted to address the following issues:

- Attainment and maintenance of the NAAQS;
- regulation of mobile sources of air pollution;
- regulation of toxic air pollutants;

- acid rain;
- establishment of nationwide operating permit and fee programs;
- mitigation and reversal of stratospheric ozone depletion;
- improvement of federal enforcement capabilities.

One of the first steps required under the new amendments is the designation of those areas currently not in compliance with the NAAQS. The 1990 amendments classify nonattainment areas according to the severity of their pollution and give an appropriate length of time to achieve attainment. Specific emissions control programs must be implemented within the various classes of nonattainment areas, and once an area is designated as nonattainment, all applicable sources in that area must comply with the CAA-mandated control programs. Additional control measures are increasingly stringent as the area classification increases in severity, and they are additive: the control measures required for one category are added to the controls required in areas ranked below it in severity.

Designation of nonattainment areas involves both the determination of the geographic boundaries of the area and the assignment of a classification for the area. Each area designated nonattainment is classified at the time of designation as marginal, moderate, serious, severe, or extreme, depending on the severity of the pollution. In comparison, Tidewater is classified as marginal, Richmond as moderate, Northern Virginia as serious, Baltimore as severe, and Los Angeles as extreme. Most of the large urbanized areas in the United States are classified nonattainment for at least one pollutant.

The classification is based on a "design value" or the extent to which the measured air quality exceeds the standard for a given pollutant. Classifications are used to determine how soon each area must achieve compliance with the NAAQS and what measures must be implemented to control pollution. Richmond is classified as a moderate nonattainment area, which has a design value range of between 0.138 parts per million (PPM) and 0.160 ppm.

Ozone is formed by a chemical reaction in the atmosphere involving volatile organic compounds (VOCs), NO_x, and sunlight. It is measured hourly and in order to be classified as nonattainment, an area must exceed the standard more than three times in three years. The NAAQS for ozone is 0.12 ppm, and the design value for the Richmond region is 0.142 ppm which exceeds the NAAQS by 0.022 ppm.

Air sampling has been conducted in the Richmond region since Richmond, Chesterfield, and Henrico were designated ozone nonattainment areas in the late 1970's to determine how much progress has been made toward attainment of the federal standards for air quality. Air sampling stations are located at the following locations:

- Hanover County at Route 627 and Raven Run;
- Henrico County at the Math-Science Center;
- Charles City County at Shirley Plantation; and
- Chesterfield County on Beach Road.

The CAA contains eleven sections or titles which detail actions to be taken to improve air quality. Following is an outline of those titles and the potential impact on the City and its residents.

Title I: Provisions for attainment and maintenance of NAAQS

Requirements for Marginal Areas (Hampton Roads):

- The state must submit a new source review permit program for construction and operation of new and modified sources. This permit program must be in place by 11/92.
- By 11/92, and every three years until attainment, the state must submit a comprehensive inventory of actual emissions from all sources of the relevant pollutant (ozone).
- By 11/92 the state must submit a State Implementation Plan (SIP) revision requiring sources of nitrogen oxides (NOx) and volatile organic compounds (VOCs) to submit emissions statements to the state each year showing actual emissions for the source.

Requirements for Moderate Areas (Richmond):

In addition to the requirements for marginal areas, the following requirements apply to moderate nonattainment areas:

- The state must submit a plan to EPA by 11/15/93 providing for at least a 15% VOC emissions reduction (measured from baseline averages over a six year period) by 11/15/96. Generally, these reductions must come from measures outlined in the SIP, not from federally mandated actions such as motor vehicle emissions reductions.

- The state must submit, by 11/15/92, a revision to the SIP provisions requiring reasonable available control technology (RACT) on all categories of all major sources (emissions of 100 tons per year or more of VOCs).

- The state must submit SIP revisions to require all gasoline dispensing facilities with a monthly throughput of 10,000 gallons or more to install Stage II vapor recovery systems to recover gasoline vapors from the fueling of motor vehicles by 11/15/92.

- The state must submit a SIP revision that includes the provisions necessary for a basic Inspection and Maintenance (I/M) program.

- Offset ratios required for new and modified sources shall be at least 1.15 to 1.

- Attainment of ozone standard (0.012 ppm) required by the end of 1996.

Additionally:

- Failure to meet the requirements of the amendments may cause the Richmond area to be reclassified as "serious" which would require additional controls.

- Requirements for major VOC sources apply to major stationary sources of NOx in all nonattainment areas.

- By 1/15/93, EPA must issue control technique guidelines for 11 additional categories of stationary source VOC emissions, giving priority to the most significant contributors to ozone nonattainment.

- By 11/15/92, EPA must establish RACT requirements for VOC emissions for marine vehicles during loading and unloading operations.

- The amendments created an Ozone Transport Region for the 11 coastal states from the Washington, D.C. area to Maine. States in this region are to submit plans to EPA to address ozone.

Title II: Provision related to mobile sources

Motor vehicles account for almost half of the emissions of VOCs and NOx, and up to 90% of the CO emissions in urban areas. This problem is attributed to the rapid growth in the number of vehicles on the road and the total miles driven. This growth has offset a large portion of the emission reductions gained from motor vehicle emissions controls. Therefore, Title II establishes more stringent

motor vehicle emission standards. The bulk of this title is Congress telling EPA what standards to impose on vehicle manufacturers, and there is little or no role for local jurisdictions or the general public.

The amendments require the following:

- Tighter emissions standards for automobiles and trucks.
- A 50% reduction in the particulate emissions from urban buses for the model year 1994. Alternatively fueled, low-polluting urban buses may be required if particulate matter standards cannot be met over the life of the engine.
- EPA must adopt regulations for on-board devices for controlling vehicle refueling emissions to be in place within one year of the issuance of the standards. These requirements will be phased in and may eliminate the need for Stage II vapor recovery.
- Alternatively fueled, low polluting buses will be required in moderate areas (such as Richmond) if EPA determines that model year 1994 buses are not capable of maintaining their pollution standard for the life of the vehicle (250,000 miles).

Title III: Air Toxics

Toxic air pollutants are those pollutants which are hazardous to human health or the environment. The CAA of 1970 required EPA to list each hazardous air pollutant that was likely to cause an increase in deaths or in serious illnesses. Within a year after listing, EPA was to establish emission standards that would apply to sources of the listed pollutant. Unfortunately, the law was never implemented, and in 20 years EPA had listed only eight pollutants: mercury, beryllium, asbestos, vinyl chloride, benzene, radionuclides, inorganic arsenic, and coke-oven emissions. In comparison, OSHA regulates 500 toxic chemicals in the workplace, and Virginia in its own air toxics program regulates several hundred.

The 1990 CAA amendments include a technology-based standard to get the program moving again. A list of 189 toxic pollutants (typically carcinogens, mutagens, or reproductive toxins) was generated and a ten year schedule requiring EPA to set standards for all major sources of those pollutants was established. A major source is one which emits more than ten tons per year of a single toxic or more than 25 tons per year of any combination of toxics. In addition the EPA must develop maximum achievable control technology (MACT) standards for each category over the next ten years. MACT standards will consider not only

pollution control equipment, but pollution prevention methods as well, such as substituting non-toxic chemicals for the toxic ones currently in use. State and local air pollution agencies will have primary responsibility to make sure industrial plants meet the standards.

Title IV: Acid rain deposition control

The objective of this section is to reduce national sulfur dioxide emissions by ten million tons per year to below 1980 levels. It is estimated that most coal-fired power plants in Virginia will not be impacted due to their use of "clean," or low sulphur, coal. The CAA amendments allows utilities to trade allowances within their systems and/or buy and sell allowances to and from other affected sources.

Title V: Permits

Heretofore, activities that created air pollution emissions were required to have a permit to operate, but were not inspected on a regular basis to determine operating emissions. The CAA amendments of 1990 introduces operating permits. These permits will be similar to NPDES permits.

All sources subject to the permit program must submit a complete permit application within 12 months of the effective date of the program. This permit will be reviewed by EPA and will be issued with a fixed term of up to five years.

Title VI: Enforcement

The CAA amendments establishes civil and criminal liabilities for corporations that knowingly violate the CAA. It also establishes authority for federal enforcement of state programs that fail to enforce SIP.

THE AVIATION SAFETY AND NOISE ABATEMENT ACT

The Aviation Safety and Noise Abatement Act authorizes assistance to land use programs for reducing noise problems between airports and surrounding incompatible uses. The Secretary of Transportation, after consultation with EPA and any other appropriate federal, state, and interstate agencies, had to promulgate regulations establishing a single system for measuring noise and a single system for measuring the exposure of individuals to noise, and identify land uses that are normally compatible with various exposures of individuals to noise.

Airport operations are to submit to the Secretary a "noise exposure map", setting out in accordance with the regulations, any noncompatible uses. Federal funding is

available to airport sponsors for "airport noise compatibility planning", which is the development of information necessary to prepare a noise exposure map or a noise compatibility program. After submission of a noise exposure map, an airport operation may submit a noise compatibility program, after public notice and comment, as well as consultation with local agencies, federal officials with local responsibility for the airport, and air carriers using the airport. The purpose of the program is to set forth measures taken or proposed, for reduction and prevention of noncompatible uses, including:

- The implementation of any preferential runway system;
- The implementation of any restriction on the use of such airport by any type or class of aircraft based on the noise characteristics of such aircraft;
- The construction of barriers and acoustical shielding, including the soundproofing of public buildings;
- The use of flight procedures to control the operation of aircraft to reduce exposure of individuals to noise in the area surrounding the airport; and
- Acquisition of land and interests therein, including, but not limited to, air rights, easements, and development rights, so as to assure the use property for purposes which are compatible with airport operations.

The Secretary is authorized to provide grants for 80 percent of the cost of any project to carry out all or part of a noise compatibility program.

VIRGINIA LEGISLATION AND PROGRAMS

VIRGINIA EROSION AND SEDIMENT CONTROL LAW OF 1973

The Virginia Erosion and Sediment Control Law seeks to provide control of soil erosion, sediment deposition, and non-agricultural runoff, to prevent the degradation of state waters. It is administered by localities and regional soil and water conservation districts.

The Virginia Erosion and Sediment Control Law establishes minimum standards for:

- Stabilization of denuded areas and soil stockpiles;
- establishment of permanent vegetation;
- protection of adjacent properties;

- timing and stabilization of sediment control measures; and
- construction of sediment basins.

Any person engaging in "land disturbing" (i.e., clearing, grading, excavating, transporting and filling of land) must submit an Erosion and Sediment Control Plan to the local government or conservation district. Exempt from this requirement are:

- Agricultural activities;
- construction of septic tanks or fields;
- preparations for construction of a single family home (not subdivision development);
- mining and oil and gas exploration;
- public utility or railroad rights of way activities;
- activities affecting less than 10,000 square feet; and
- emergency work.

Enforcement actions include injunctive relief and penalties of up to $2,000 and charges of a Class 1 misdemeanor.

STORMWATER MANAGEMENT ACT

The Stormwater Management Act was passed in the 1989 General Assembly, giving localities the option of adopting Stormwater Management Plans. The implementing regulations promulgated by the Department of Conservation and Natural Resources (DCNR) are related in their thrust:

- Require management of post-development runoff so that it is similar in quality to pre-development runoff;
- establish minimum design criteria to control non-point source pollution, localized flooding, and prevention of stream channel erosion;
- require long-term maintenance of stormwater management control devices; and
- require certain administrative procedures for local programs.

Adoption of Stormwater Management Plans by localities is not mandatory, and to date Richmond has not chosen to adopt a plan according to the State guidelines.

SUBAQUEOUS BOTTOM LANDS

Subaqueous bottomlands, including river beds, stream beds, and channels are all considered the property of the Commonwealth of Virginia. As such, they are subject to regulation. The VMRC is empowered to issue permits which allow the encroachment upon state bottomlands. These permits do not interfere with the riparian owners' rights and privileges, which extend to the "mean low-water mark." There are five exemptions from permitting:

- Erection of authorized dams;
- the lawful and permitted taking of shellfish;
- federal navigation and flood-control measures;
- piers, docks, terminals, and facilities owned by the State and leased to localities; and
- noncommercial private piers.

THE CHESAPEAKE BAY PRESERVATION ACT

The Chesapeake Bay Preservation Act was adopted by the 1988 Virginia General Assembly and requires local governments to take specific actions to regulate development as a means of protecting and improving water quality in the Chesapeake Bay. The Act established the Chesapeake Bay Local Assistance Board or (CBLAB), which promulgated a set of regulations which must be adhered to by all jurisdictions covered by the Act.

The Chesapeake Bay Preservation Act and the Regulations require local designation of Chesapeake Bay Preservation Areas (CPBAs). These areas include:

1. Resource Protection Areas (RPAs) consist of those lands located "at or near the shoreline" that have an intrinsic water quality value due to the ecological and biological processes they perform. RPAs must consist of the following:
   - Tidal shores;
   - tidal wetlands;
   - certain non-tidal wetlands; and
   - a 100' buffer area adjacent to the above and all tributary streams.

2. Resource Management Areas (RMAs), which consist of those land types that if improperly used or developed have a potential for causing significant water quality degradation. Local governments should consider including the following in RMAs:

   - Isolated non-tidal wetlands;
   - 100 year floodplains;
   - highly erodible soils and steep slopes;
   - highly permeable soils; or
   - other applicable lands.

3. Intensely Developed Areas (IDAs), which consist of those areas where "little of the natural environment remains," and where the development of infill parcels is permitted.

The Regulations require local governments to adopt performance criteria for development within CBPAs, and to amend appropriate land use ordinances. The following performance criteria apply to all development in Chesapeake Bay Preservation Areas:

- Minimization of land disturbance;
- preservation of indigenous vegetation;
- minimization of impervious cover;
- maintenance of best management practices;
- erosion and sediment control ordinance compliance required;
- site plan review required;
- septic system pump out required (every 5 years); and
- either a 10% reduction in non-point source pollution generated by a site or no increase over the existing, depending on the type of development: new development requires a no net increase in pollutant loads; redevelopment requires a 10% reduction in pollutant loads.

Development may take place in the RPA provided it meets the following criteria:

- It must be a water dependant use or must be redevelopment of an existing use;

- a Water Quality Impact Assessment must be performed;
- a 100' vegetated buffer must be maintained (there are provisions for reducing the buffer in certain situations); and
- certain recreation, transportation and infrastructure activities are exempt from these criteria.

As presently proposed, approximately 3% of the City's land area is within the Resource Protection Area. The Resource Management Area for the City includes a 500' linear distance from the RPA, plus the limits of the 100 year floodplain and some isolated non-tidal wetlands as identified on the CBPA. The RMA covers approximately 16% of the City's land area. The City's Intensely Developed Areas (IDAs) are found primarily in the downtown area adjacent to the James River and the canals.

THE VIRGINIA WETLANDS ACT

The Virginia Wetlands Act establishes three standards to govern the use and development of wetlands:

- Wetlands of primary ecological significance shall not be altered [or] unreasonably disturbed;
- Development in Tidewater Virginia shall be concentrated in wetlands of lesser ecological significance, and in areas apart from the wetlands; and
- Guidelines promulgated by the VMRC shall be considered in applying the foregoing standards.

Exempted activities include:

- Agricultural, silvicultural, and horticultural activities;
- cultivation and harvest of shellfish and worms for bait;
- maintenance and repair of roads and railways;
- outdoor recreational activities that do not disturb the wetlands;
- construction and maintenance of noncommercial piers, boat houses, and fences constructed so as to preserve tidal flow;
- construction of navigation aids;
- maintenance of man-made drainage ditches;

- governmental activities; and
- activities undertaken pursuant to emergency decrees.

The Act presents a Model Wetlands Zoning Ordinance which localities may adopt. Under this ordinance, a local wetlands board is established and participates in the permitting process. Under this ordinance, specific actions are outlined which must be followed before development can occur in a wetland.

PUBLIC WATER SUPPLY ACT

The State Department of Health regulates drinking water quality pursuant to the Virginia Public Water Supply Act, by issuing permits which require compliance with state and national standards. The State Health Department also has the primary responsibility for enforcing compliance with all drinking water standards, national and state, and any other terms of the permits.

The State Department of Health has promulgated Waterworks Regulations to guide its regulatory functions under the Public Water Supply Act. These regulations include:

- Minimum health and aesthetic standards for pure water (water fit for human consumption and domestic use) and for water taken into waterworks;
- Criteria for the siting, design and construction of water supplies and waterworks;
- Requirements for inspections and testing of water; and
- Requirements for issuing permits.

If a water system provides water for human consumption and has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year, it is deemed to be a "waterworks" and is subject to regulation. The term waterworks includes all structures, equipment, and appurtenances used in the storage, collection, purification, treatment and distribution of pure water, except the piping and fixtures inside the building where the water is delivered. Federal and state regulations do not apply to:

- Systems which consist only of distribution and storage facilities (system does not have any water production or treatment facilities);

- Systems which obtain all its water from, but is not owned or operated by, a public water system to which regulations do apply;
- Systems which do not sell water to any person; and
- Systems which are not carriers that convey passengers or interstate commerce.

The state Waterworks Regulations cover the same subjects as the federal regulations, but provide one notable addition: they require each waterworks to establish and enforce a program of cross-connection control and backflow prevention. Cross-connections are connections in the water system which could allow "backflow" to occur. Backflow is the flow of liquids into the water system from what should be a discharge point, causing potential contamination of the water system.

VIRGINIA UNDERGROUND STORAGE TANK PROGRAM (UST)

The Virginia (UST) Program is administered by the State Water Control Board (SWCB) as directed by state and federal laws and regulations.

Federal UST Regulations:
Technical Standards Effective - December 22, 1988
Financial Regulation Effective - January 24, 1989

State UST Regulations:
Technical Standards Effective - October 25, 1989
Financial Regulation Effective - May 9, 1990

The State UST regulations go further than the federal by:

- regulating all heating oil tanks greater than 5,000 gallons capacity;
- requiring notification of all UST's taken out of use before January 1, 1974 yet still in the ground; and
- by activating the Virginia Underground Petroleum Storage Tank Fund (VUPSTF) for use in cleanups and certain third party claims; and by using the VUPSTF for demonstrating financial responsibility for tank owners and operators above the state's per occurrence levels of $50,000 for corrective action and $150,000 for third party liability up to the federal $500,000-$1 million per occurrence and $1-$2 million annual aggregate levels.

The major state technical regulation requirements include:

New USTs (for tanks installed after December 22, 1988):

- permit from local official;
- release detection;
- corrosion protection (tanks/pipes);
- spill/overfill preventions; and
- notification/tank status changes to SWCB.

Existing USTs (for tanks installed prior to December 22, 1988):

- permit from local official;
- release detection by December 22, 1989-1993 based on tank age;
- corrosion protection (tanks/pipes) by December 22, 1988;
- spill/overfill protections by December 22, 1998; and
- closure with site closure assessment.

SOLID WASTE MANAGEMENT REGULATIONS

The Solid Waste Management Regulations were promulgated in 1988 by the Virginia Waste Management Board pursuant to the Virginia Waste Management Act. The purpose of these regulations is to establish standards and procedures for the construction, operation, maintenance, closure and post-closure of solid waste management facilities in order to protect the public and the environment; to prevent and eliminate the open dumping of solid waste; and to set forth requirements for undertaking corrective action at solid waste management facilities where environmental problems have occurred.

The regulations "apply to all persons who manage or dispose of solid wastes." They also provide for certain exemptions and delayed compliance for certain existing facilities. The regulations specifically exempt the composting of sewage sludge at sewage treatment plants; land application of certain wastes; management of hazardous waste; operation of temporary solid waste storage or compaction facilities; landfilling of inert material such as rocks, brick and concrete; operation of wastewater treatment facilities; and handling infectious wastes regulated by other Department regulations.

Under these regulations, all solid waste management facilities must be permitted by the Virginia Waste

Management Board. The permit application process is as follows:

- The applicant files a notice of intent with the DWM, which must give the exact location of the proposed facility;
- DWM then notifies the local governing body that a permit has been applied for. The local government must certify that the location and operation of the proposed facility is in compliance with all local ordinances. Upon this certification, the application review process formally begins;
- Part A of the application includes information on the suitability of the site to house a solid waste facility. The DWM must notify the applicant within 15 days of submission if Part A of the application is incomplete;
- Upon approval of the Part A application, the applicant may submit Part B, which includes detailed plans for construction and operation of the facility. Part B also calls for financial assurance documentation, if the applicant is not a governmental entity, to show that the applicant will be able to adequately close and maintain the site;
- If the application meets all requirements a draft permit is prepared and a notice of the availability of the proposed draft permit is made in a local newspaper;
- If requests for a public hearing on the proposed draft are received by the DWM, a public hearing is scheduled and notice is published at least 30 days in advance of the hearing. The hearing is held by DWM within the local government jurisdiction of the proposed facility; and
- A public comment period extends for ten days after the close of the hearing. A final decision to permit, deny a permit, or amend the final permit is rendered by DWM within 30 days of the close of the comment period.

The department may deny a permit if:

- the facility is not consistent with local ordinances;
- the application is not complete;
- the facility does not conform with siting standards;
- the facility fails to comply with design, construction, or operating standards;

- the facility may have an adverse impact on the environment; or

- the facility fails to fulfill financial assurance requirements.

INFECTIOUS WASTE MANAGEMENT REGULATIONS

In May of 1990, the Waste Management Board promulgated the Infectious Waste Management Regulations. Infectious waste is defined as solid wastes which contain pathogens with sufficient virulence and quantity that exposure to the waste by a susceptible host could result in an infectious disease. The regulations were promulgated in order to establish standards and procedures pertaining to infectious waste management in order to protect the public health and public safety, and to enhance the environment and natural resources.

The regulations apply to all persons who generate infectious waste, own or operate infectious waste management facilities, or allow infectious waste management facilities to be operated on their property; and all existing infectious waste management facilities, including those operating under a permit on the effective date of the regulations. Any infectious waste management facility must also comply with the Solid Waste Management Regulations issued by DWM, and any applicable sections of the Hazardous Waste Management Regulations issued by the Department.

Exemptions to the regulations include:

- composting of sewage sludge at the sewage treatment plant of generation;

- land application of wastes regulated by the State Board of Health, the State Water Control Board, or any other state agency with such authority;

- wastewater treatment or pre-treatment facilities permitted by the State Water Control Board; and

- management of hazardous waste as defined and controlled by the Virginia Hazardous Waste Management Regulations to the extent that requirements of those regulations are in conflict with the infectious waste regulations.

Health care professionals who generate infectious waste in the provision of health care services in their own office or in the private home of a patient, provided the waste is disposed of as follows:

- Up to 64 gallons of infectious waste, other than sharps, generated by health care professionals may be accumulated, then it must be packaged and labeled according to the regulations, and delivered within 14 days to a permitted infectious waste treatment or storage facility.

- Sharps must be packaged in rigid, leak-proof and puncture-resistant containers and labeled in accordance with the regulations and, prior to the container being filled to capacity, delivered to a permitted infectious waste treatment or storage facility.

- The health care professional must transport, or arrange for the transportation of infectious waste either directly, by an employee, or by a transporter registered as such with the DWM.

The regulations contain special requirements for storage facilities, transportation, incineration, and steam sterilization of infectious waste. In addition, the following permit application and issuance process is outlined:

- Any person who is required to have a permit must complete an application and submit detailed information as outlined in the regulations (including a certification from the governing body of the locality in which the facility will be located that the location and operation of the facility are consistent with all applicable ordinances).

- Upon receipt of a complete application, the DWM will tentatively decide whether to prepare a draft permit or to deny the application.

- If a decision to deny the permit application is made, a notice of intent to deny (a type of draft permit following the same procedures as any draft permit) is issued. If the DWM makes a final decision that the tentative decision was incorrect, the notice of intent to deny shall be withdrawn and a draft permit prepared.

- If a draft permit is issued, public notice is given that either a draft permit has been prepared or a hearing has been scheduled.

- Public notice of the preparation of a draft permit or the intent to deny a permit application shall allow at least 45 days for public comment.

- During the public comment period any interested person may submit written comments on the draft permit and may request a public hearing if no hearing has already been scheduled.

- Public notice of a public hearing shall be given at least 30 days before the hearing.

- When a final permit is issued the DWM will respond to public comments, specifying which provisions, if any, of the draft permit have been changed and the reasons for the change; and, describe and respond to all significant comments on the draft permit raised during the public comment period and public hearing.

REGULATIONS FOR THE DEVELOPMENT OF SOLID WASTE MANAGEMENT PLANS

In May of 1990, the Waste Management Board promulgated Regulations for the Development of Solid Waste Management Plans. The purpose of the regulations is to (1) establish minimum solid waste management standards and planning requirements for protection of the public health, public safety, the environment, and natural resources throughout the Commonwealth; to promote local and regional planning that provides for environmentally sound solid waste management with the most effective and efficient use of available resources; (2) establish procedures and rules for designation of regional boundaries for solid waste management plans; (3) establish state, local government, and regional responsibility for meeting the minimum recycling rates of 10% by 1991, 15% by 1993 and 25% by 1995; (4) establish procedures for withholding permits to local governments for solid waste management facilities after July 1, 1992 pending approval of a solid waste management plan; and (5) provide for a reasonable variance and exemption process. The regulations apply to all cities, counties, and towns or designated regions, regional planning districts or public service authorities and require the preparation and submission of plans for the development of comprehensive and integrated solid waste management plans that, at a minimum, consider all components of the waste management hierarchy of source reduction, reuse, recycling, resource recovery.

THE CLEAN INDOOR AIR ACT

The Virginia Clean Indoor Air Act was passed by the General Assembly during the 1990 session and regulates smoking in public buildings. According to the Act, reasonable no smoking areas must be provided in:

- Any building owned or leased by the Commonwealth or any agency thereof; and

- any building owned or leased by a county, city, or town.

Moreover, smoking is prohibited in:

- elevators;
- public school buses;
- common areas of any public school;
- hospital emergency rooms;
- local health departments;
- polling places; and
- indoor service or cashier lines.

Restaurants having a seating capacity of 50 people or more must provide no smoking areas sufficient to meet customer demand.

The Act delegates enforcement authority to the localities. Thus far the City has not passed an ordinance attempting to regulate smoking in public places; however, should the City decide to pass such an ordinance the ordinance must prohibit smoking in the areas identified in the Act, and may provide for regulation of smoking in the following areas:

- retail establishments of 15,000 square feet or more;
- rooms in which public meetings are being held;
- places of entertainment;
- indoor recreational facilities; and
- other public places.

Local ordinances cannot prohibit smoking in the following areas:

- Bars and lounge areas;
- Retail tobacco stores;
- Restaurants or other public places being used for private functions;
- Office or work areas not generally open to the public;
- Areas of shopping malls external to retail stores; and
- Lobby areas of hotels and motels.

VIRGINIA NOISE ABATEMENT POLICY

The State Noise Abatement Policy establishes consistent criteria for providing noise abatement measures on all proposed highway projects regardless of funding. The policy mirrors the Federal Highway Administration (FHA) Noise Abatement Criteria currently employed by VDOT for federal aid projects. This policy applies only to proposed highway construction and improvement projects, not to existing highways.

The Virginia Department of Transportation (VDOT) will use the following criteria in determining the need and feasibility of noise abatement measures on all projects in the commonwealth.

- The guiding document for analysis and abatement of highway traffic noise on all proposed highway projects is the Federal Aid Highway Program Manual.

- The source height for assessing traffic noise levels or determining dimensions of a noise barrier are; 8 feet for tractor trailers, 2.3 feet for medium trucks, and 0 feet for automobiles.

- Highway noise impacts beyond 1000 feet from the roadway will not be considered in determining the need of and the dimensions and cost of a noise barrier.

- A noise abatement measure will be considered if,

  1. It provides a minimum of 5 dB(A) attenuation (positive noise benefit) and

  2. The design year noise levels emanating from the project equal or exceed the FHA Noise Abatement Criteria for various land use categories; or

  3. The design year noise levels emanating from the project exceed existing noise levels by 10 dB(A) or more.

- A noise abatement measure will be considered not cost effective if the cost exceeds $20,000.00 per receptor.

- Extenuating circumstances will be considered on an individual project basis.

- Responsibility for gathering all relevant information and making recommendations on noise abatement will rest with the joint FHA-VDOT Noise Abatement Committee on federal aid projects and with VDOT on non-federal aid projects.

- Final determination on all noise abatement related issues will be made by the Chief Engineer.

For non-federal aid projects the Policy requires:

- a 50% contribution to the cost of abatement by the locality through which the project traverses; and

- the locality to have an ordinance requiring developers to provide noise abatement for all new residential, and other noise sensitive development adjacent to existing highways or known future highway corridors.

CITY OF RICHMOND LEGISLATION AND PROGRAMS

CITY'S FLOODPLAIN MANAGEMENT ORDINANCE

The purpose of the Floodplain Management Ordinance is to promote the public health, safety, and general welfare through the establishment of comprehensive floodplain management regulations designated to minimize loss of life and property due to flooding conditions, prevent unnecessary disruption of public funds for flood protection and relief and contribute to the maintenance of a stable tax base. The Virginia Erosion and Sediment Control Law is administered by the City of Richmond as part of it Floodplain Management Ordinance.

The requirements and procedures for review of proposed development and land disturbing activity within designated floodplain districts include provisions for:

- Prohibiting development and land-disturbing activity which, acting alone or in combination with other development or activity, will cause unacceptable increases in flood heights or velocities;

- restricting or prohibiting certain development and land-disturbing activity within areas subject to flooding;

- requiring that development permitted in floodplain districts be protected and/or floodproofed against flooding and flood damage in accordance with applicable provisions of the Virginia Uniform Statewide Building Code;

- controlling the alteration or relocation of watercourses, channels, and floodplains, and controlling filling, grading, and other land-disturbing activity within floodplain areas in accordance with state and local requirements and procedures; and

- ensuring that those who develop land subject to flooding are aware of potential flood hazards and assume responsibility for their actions.